THE DIVAD ARCHAEOLOGICAL PROJECT

by
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FOREWORD

This report provides the first published information about the results of an archaeological survey and testing project that facilitated construction of a dirt airstrip (the "DIVAD" airstrip) on McGregor Range of Fort Bliss Military Reservation, located in the state of New Mexico. The results of the survey were used to position the airstrip where there was a low density of sites, and subsequent testing demonstrated all the sites that would be affected by the construction were on deflated surfaces and that none had subsurface remains.

This report summarizes the general results of the project. It also summarizes the results of a small, but very significant, project conducted after the archaeological field work and construction of the airstrip were completed.

This later project investigated an aspect of the very problematical, 100-year-long "Dona Ana" Phase, one of the cultural-historical units defined for the area's Formative period. Recognitional criteria for this phase are so poorly developed that some archaeologists (cf., Whalen 1977, 1978) simply ignore the phase altogether. Others (cf., Carmichael 1986) attempt to recognize sites of this phase and to use them in their interpretation of the region's archaeological record.

It has long been acknowledged that the ceramic assemblage typically used to identify Doña Ana sites is a mixture of late Mesilla phase (pit house) and early El Paso phase (pueblo) ceramics. It has been debated whether there ever was a Doña Ana phase whose land use and subsistence systems were such that their remains can be partitioned from the remains of the previous pit house and the later pueblo systems. Some have thought that many Doña Ana phase sites could be multicomponent sites, with late pit house and early pueblo occupations. Others have proposed that locations of Doña Ana phase sites could have been continuously occupied by populations that changed their ceramics from those typical of the late pit house to those of the early pueblo, producing a Doña Ana phase assemblage with no intervening, distinctive "Doña Ana" adaptation.

This report does not answer the critical question: Does the archaeological record contain a Doña Ana phase adaptation different from the late pit house and early pueblo adaptations? It does, however, contribute to the debate by demonstrating that not all Doña Ana ceramic assemblages can be accepted as representing a Doña Ana site. The report describes a multicomponent site at which parts of the two occupations are spatially separated but at which there also is spatial overlap in the remains of the two occupations--the overlap area contains a Doña Ana assemblage! This finding confirms that not all Doña Ana sites are what they may seem, and it documents the need for extreme caution in defining such sites until recognitional criteria are better developed and more well grounded.

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ACKNOWLEDGEMENTS

A number of individuals were involved in the project during the initial survey and excavation phase in 1979 and early 1980. I was not one of them, and so it is almost certain I will leave out individuals who were instrumental in this early phase of the project. Survey, surface collection, and test excavations were directed by Lorrain Mattson and Floyd Geery. The field crews consisted of Mark Calamia, Louis Foix, Richard Sullivan, and Kenneth West. The quantitative sample collections undertaken between January and May of 1984 were performed almost entirely by volunteers. There are not many people who will give up weekends to work in cold temperatures and drizzle in January or hot, dusty days in May in order to add to our understanding of the prehistoric sequence of the El Paso area. I hope they are not disappointed with the results. The field crews included, at various times, Louis Acuna, Jean Berry, Gene Collins, Jeannine Collins, Dr. Glen DeGarmo, John C. Haight, Robert Hard, Alec Knight, Sid Shepperd, and Hal Siros. Special thanks to Jean, who often kept me going in January and February, when it was cold.

R. Jane Bradley, Melinda Gebel, Dr. Vernon Scarborough, Dr. David Carmichael, John C. Haight, Kevin VonFinger, Brett Russell, Tom O'Laughlin, Lisa J. LeCount, Paul Lukowski, Steve Tomka, and numerous other colleagues and friends all listened to me ramble on about the project and attempted to guide me in profitable directions. At least they tried. Carrie E. Smith read an initial draft of this report and offered several useful suggestions, as did Dr. Glen DeGarmo. Finally, special thanks must go to Robert J. Hard, who supported the project with his time, knowledge, and "humor," and Dr. Glen DeGarmo. In many ways, the archaeological program at the Environmental Management Office is the house that Glen built. I appreciate the opportunity to work in such an "environment."

Raymond Mauldin
June, 1987

This report was written principally in 1985 and 1986. Since that time, a great deal of work has been conducted in the Jornada region and on Fort Bliss. That work is not included in this report. Many of my suggestions, outlined in the last chapter of this report, no longer are relevant or already have been accomplished. Such is the nature of archaeological research.

Finally, thanks must go to George Towers, Dr. Glen DeGarmo, and Donna Rand for facilitating the production of the report.

Raymond Mauldin
January, 1993

Chapter I

INTRODUCTION

This report summarizes the results of the Division Air Defense (DIVAD) archaeological project. The project was initiated in response to a proposal to construct and use airstrip facilities on McGregor Guided Missile Range on Fort Bliss, a military installation in far western Texas and southern New Mexico. The project was designed to mitigate the adverse effect of the airstrip's construction upon prehistoric cultural remains. It was conducted by the Fort Bliss Environmental Management Office from August of 1979 to January of 1980. Fieldwork consisted of a survey of approximately 35 km^2. Sixty-nine prehistoric sites were recorded.

The survey, limited surface collection on some sites, and test excavations on a few, were completed in December of 1979, and preliminary analysis was begun. However, funding limitations prevented the analytical stage of the project from being completed. The results of the project were not synthesized. In January of 1984, the author began analysis of the 1979 data. Additional fieldwork was conducted. This fieldwork involved revisiting many of the original 69 sites and collecting quantitative data from a single site. While some of these data have appeared elsewhere (Mauldin 1984; West 1982), this report represents the first detailed summary of the DIVAD archaeological project. The project was synthesized in accordance with the Fort Bliss Historic Preservation Plan (1982).

Fort Bliss Management Program

Fort Bliss Military Reservation, located in Doña Ana and Otero counties in New Mexico and El Paso County, Texas, occupies more than 4,400 km^2. Fort Bliss's mission involves various forms of military training, including active maneuvering, missile firings, and field artillery and small arms training. The post, in conformance with historic resource legislation, has been engaged in archaeological management activities since the mid-1970s. Archaeological inventory surveys have been performed on the entire 1,500 km^2 used for active maneuvering, and more than 10,000 archaeological sites have been identified (Beckes, Dibble, and Freeman 1977; Carmichael 1983; Skelton et al. 1981; Whalen 1977, 1978). It is estimated that there are more than 25,000 archaeological sites on the post.

The Fort Bliss Historic Preservation Plan (1982) was developed to manage this extensive resource base. The preservation plan represents an attempt to accommodate military land-use requirements while satisfying archaeological and legal concerns. The plan mandates the preservation of samples of the temporal and functional components documented as representing the post's prehistoric cultures.

The Fort Bliss Environmental Management Office actively is researching the prehistory of the base. On-post archaeological projects are concerned with developing cost-effective methods for the identification of relevant temporal and functional components. (DeGarmo 1983).

A district/avoidance strategy is effective for most military uses. "Off-limits" districts containing preliminary representative samples have been designated and are being avoided by military activities. However, the military occasionally finds it necessary to construct additional training facilities. Whenever possible, these facilities are located in areas lacking archaeological material. But, in some cases, military requirements make complete avoidance of archaeological resources impossible. The impact of military activity upon these resources then must be mitigated. In the late 1970s, the construction of airstrip facilities on McGregor Guided Missile Range posed a threat to archaeological remains. The DIVAD archaeological project was initiated to provide information permitting the airstrip to be located in an area where damage to archaeological resources would be avoided or minimized. The airstrip was constructed at a location where survey and subsurface testing demonstrated that "no effect" would be caused to significant sites.

This analysis of the DIVAD data is directly relevant to the continued implementation of the Fort Bliss Historic Preservation Plan. While much of the fieldwork associated with the DIVAD project was undertaken before the provisions of the plan were approved in 1982, the data collected provide an opportunity to investigate variability in temporal and functional components.

Report Summary

The current report uses environmental data from the region, presented in Chapter II, to argue that the lower alluvial fans associated with mountains should have been reused frequently during much of the prehistoric sequence because they provide a reliable water supply and a high level of soil moisture. This relationship complicates developing test implications for synchronic patterns of land use such as those suggested by Hard (1983b) for the late Formative (Mesilla phase) and Mauldin (1984) for the El Paso phase. These models of settlement and subsistence, which have been used to structure several archaeological investigations on Fort Bliss, essentially are descriptions of how prehistoric systems may have functioned at a given point in time. However, long-term cultural processes may obscure the artifact assemblages that correspond to these synchronic models. The reoccupation of the same location for different activities at different times and the subsequent scavenging of artifacts from sites make the direct testing of these synchronic models problematic.

In order to assess the complications resulting from reoccupation and scavenging, it is necessary to develop and test ideas about how the region may have been used by prehistoric groups. Chapter III presents an initial attempt to develop expectations for site locations and artifact assemblages generated by a series of behavioral and organizational systems.

Using recent ethnographic summaries of settlement and subsistence systems, as well as previously outlined models of subsistence and settlement for the prehistory of the El Paso region, it is suggested that settlement patterns and artifact assemblages can be conceptualized in terms of a series of spatial zones. This five-zone model is composed of a residential core, a foraging radius surrounding the residential core, a logistical zone beyond the foraging radius, an annual range potentially composed of several residential sites and their associated foraging and logistical areas, and an extended range that may contain several annual ranges. Changes in the size of the extended range, which may result from changes in regional population, may influence the frequency of site reoccupation and cause different patterns in the reuse of artifacts, features, and structures.

The Paleo-Indian period and much of the Archaic period are thought to have been characterized by high mobility. During these periods, sites should have been occupied briefly and reused infrequently. Under these conditions, the artifact assemblages at sites should have a high degree of integrity. Through the late Archaic and into much of the Formative, reuse should have increased as mobility decreased, possibly as a function of increasing regional population densities. Annual ranges, parts of which previously were abandoned for long periods, would have been used more thoroughly. During such periods of moderate mobility, certain locations may have been used for a variety of different activities. For example, sites originally established as logistical camps may have been reoccupied as residential sites. Direct evaluation of subsistence/settlement models would be most difficult for moderately mobile adaptations, characterized by this pattern of site reoccupation.

In the late Formative the extended range and annual range may have coincided more closely because of reduced mobility. Under these conditions, the frequency of reuse would have remained high, but the use of a specific site for different purposes is expected to have decreased. Locations used in a logistical manner are unlikely to have been reused in a different role (e.g., residential), for the generation of new residential sites would have been relatively infrequent.

This scenario suggests high-integrity site assemblages probably were produced both by extremely mobile as well as by sedentary cultural systems. The degree to which sedentary settlement systems developed in the El Paso region, however, is unclear.

These expectations are joined with the environmental observations outlined in the second chapter to suggest alluvial fans probably were used frequently. These locations may have been selected for residential sites because of their higher plant and animal productivity and because water may have been available during most seasons. Sites in this zone probably were reused frequently in later periods as the extended range shrank and the supply of artifactual materials and structures generated by previous occupations grew. The presence of artifacts, features, and in some cases structures, left by former residents, provided opportunities for scavenging, and probably resulted in highly complex assemblage composition. Playas away from the lower alluvial fans receive water from late summer rains; these playas offer an unpredictable water supply during this season. Such locations probably were used primarily for logistical activities. The mountain uplands also are thought to have been used in a logistical manner. The segment of the environment that lacks water, the central basin, should have been part of the foraging zone during all periods.

The site distribution in the DIVAD project area, discussed in Chapter IV, is interpreted in light of this model of long-term land use. Aspects of previously developed synchronic models of prehistoric subsistence and settlement in the region are incorporated in this interpretation as well.

Chapter IV also documents the pervasive effects of geomorphological processes on site distributions. Not only human behavior, the reoccupation of the same environmental zone and scavenging of material from previous occupations, but also natural phenomena such as deposition and erosion complicate direct evaluation of subsistence/settlement models. These geomorphological processes can obscure, as well as uncover, evidence of prehistoric activities. The lack of sites in the central part of the DIVAD survey is argued to be the result of the relatively recent accumulation of large sand dunes. Sites on the edges of the alluvial fans, conversely, are exposed because of recent erosion or modern developments, such as road construction.

The possibility that the lower alluvial slopes were reused frequently during most of the cultural history of the region also interferes with the recognition of the Doña Ana phase, the transitional phase between the Pithouse and Pueblo periods. Carmichael (1983) has argued that this phase can be identified by the co-occurrence of Mimbres Black-on-white, Chupadero Black-on-white, and a variety of less common ceramic types. He documents numerous large sites that have this ceramic assemblage. The vast majority of these sites are located on the lower alluvial fans associated with mountain ranges. However, if reoccupation was frequent in this environmental setting, then it is possible that the co-occurrence of Mimbres and Chupadero on the same site can result from reoccupation, and the two ceramic types in the same assemblage may not be evidence of contemporarity!

In order to examine the possible effects of reoccupation and scavenging on both the temporal assignment of sites and the interpretation of their functional and organizational aspects, site FB5027, a large site located in the lower alluvial fan zone, was analyzed. At FB5027, both Mimbres and Chupadero were present in midden contexts; therefore, the site would be assigned to the Doña Ana phase using Carmichael's criteria.

Yet, an analysis of the ceramics suggests the apparent Doña Ana assemblage may be the result of reoccupation rather than representative of a single temporal phase. These findings are presented in Chapter V.

Scavenging, an aspect of site reoccupation, is suggested by patterning in the lithic assemblage at FB5027. It is suggested that chipped stone was removed from the earlier component on the site by later occupants. Patterns in ground stone and thermally altered rock also may reflect scavenging.

Ceramic analysis at FB5027 and information presented in several recent studies resulted in the proposal of a new time frame for the Doña Ana phase. If the phase is defined based on the co-occurrence of Mimbres Black-on-white and Chupadero, the phase lasts from 1100 to 1150 A.D.

The sixth chapter of this report summarizes the DIVAD archaeological project and provides suggestions for further research. The remaining section of the current chapter summarizes the mitigation procedures used on the project.

Survey and Mitigation Procedures

The DIVAD airstrip facility was to be located on a part of McGregor Range not surveyed previously by archaeologists. Consequently, the project's initial task was to survey the proposed airstrip site. The survey technique employed enabled crews to cover a 35-km^2 area (see Whalen 1977 for a detailed description of this technique.) The survey was conducted using 1:3000 aerial photographs. The location of prehistoric features and isolated artifacts can be recorded directly on these aerial photographs. The photos also enable site sizes and artifact densities to be estimated.

The survey recorded 69 prehistoric archaeological sites in the project area. Sites were defined somewhat subjectively–absolute quantitative criteria were not employed to define sites. The sites range in size from less than .01 ha to greater than 10.0 ha.

The airstrip was positioned to avoid the majority of these sites while satisfying military requirements. Nevertheless, the construction and use of the airstrip was expected to affect more than 20 sites. It was predicted that construction activities would damage four sites; 18 additional sites were considered close enough to the airstrip location to require surface collection to make the sites more obscure to users of the airstrip.

Surface collection and test excavation procedures were conducted on the four locations that were to be affected directly by construction activities. None of these were found to have intact subsurface materials. Although some information resulting from excavation is presented in Appendix A, the excavation data are not used extensively in this report. All recovered material is stored at the Environmental Management Office.

Qualitative observations were made and surface collections undertaken on the 18 indirectly affected sites. These procedures varied in intensity, ranging from collection of all artifactual materials on small sites to partial collection of some artifact categories on large sites. Collection areas were plotted on the 1:3000 photos. In some cases, grid systems were established to tightly control artifact provenience data. On several sites, artifacts were present only in blowouts (erosional areas) in heavy sand dunes. In these cases, the blowouts were assigned numbers and collections were made using the blowouts as provenience.

Qualitative distinctions were made between artifacts at the industry level (e.g., ceramics, lithics). A sampling of ceramic and lithic artifact types was collected, as were items thought to be attractive to private collectors (e.g., whole ground stone tools, projectile points). Sites were assigned to general temporal categories on the basis of these artifactual data.

Survey and site mitigation procedures were completed in December of 1979. However, funding limitations forced curtailment of the project before laboratory analysis could be completed. In January of 1984, the author began to consolidate the analysis and survey data for this report. Additional work consisted of the analysis of artifactual material collected from a series of randomly selected 4- by 4-m units on a single site, FB5027, located in the southwestern part of the project area. These data are summarized in Appendix B.

Chapter II

ENVIRONMENTAL SETTING AND CULTURAL HISTORY

This chapter briefly describes the region's physical environment and cultural history, and it summarizes previous research conducted near the study area. More thorough summaries of the cultural history of the region (Bradley 1983; Carmichael 1983; Fields and Girard 1983; O'Laughlin 1980) and local environment (Orton 1978) are available. The climatic and cultural history summaries provided below are taken from these, as well as additional sources (e.g., Reynolds 1956; United States Weather Bureau Records, El Paso Station).

The Regional Environment

The El Paso region is characterized by warm-to-hot days, cool nights, and low humidity. Temperatures range from a high monthly average of 35.2° C in June to a low of 13.5° C in January. Diurnal temperature differences are substantial. The frost-free period, from March through October, averages 237 days a year. The mean annual rainfall is 20.1 cm, more than half of which falls between July and September. There is considerable year-to-year variability; the wettest year on record is 1884 (46.5 cm) and the driest year is 1891 (5.6 cm). Evapotranspiration averages more than 200 cm a year, resulting in a substantial water deficit. As in most desert environments, energy transfer within the ecosystem is limited by available soil moisture, itself closely tied to rainfall and runoff (Noy-Meir 1973, 1974). Soil moisture is greatest during the summer months. The frequent summer thunderstorms are quite intense, often releasing large amounts of water in short periods of time. These violent cloudbursts saturate the soil and generate water runoff. Fall, winter, and spring storms are less intense and generally do not produce runoff.

Information on paleoenvironmental conditions in the El Paso area comes from two chief sources: pollen and pack rat middens. Pollen studies by Culley and Clary (1980); Horowitz, Gerald, and Chaiffetz (1981); and Freeman (1972) are supplemented by Van Devender's work on pack rat middens (Van Devender and Spaulding 1979; Van Devender and Toolin 1982). These studies differ on several details, but both sources indicate macroclimatic conditions have not changed dramatically since Chihuahuan desert shrub vegetation became dominant about 5,000 years ago. Since 3000 B.C. the passing of floral dominance back and forth between woody shrubs and grasslands has been the most important environmental change. The introduction of large herds of cattle after 1880 appears to have tipped the scales in favor of the woody shrubs that now dominate the area's landscape.

Because of this environmental constancy, we can use modern climatic conditions to model prehistoric spatial and temporal resource distribution subsequent to 3000 B.C. Hard and Mauldin (1986) have identified five environmental zones in the El Paso area (see also Carmichael 1983; O'Laughlin 1980; Whalen 1977, 1978). The (1) riverine zone consists of the Rio Grande drainage and flood plain. The (2) mountain zone is composed of the bedrock uplands, and the (3) alluvial fan zone is made up of the alluvial fans associated with the mountain ranges. Infrequently, large playas are found at the bases of these alluvial fans. The (4) central basin zone lies between the mountainous areas, while the (5) central basin playa zone encompasses the many small playas dotting the central basin. This environmental classification is based on differences in resource availability thought to have influenced the way prehistoric groups used the area. The same classificatory scheme will be employed in the present report.

The Project Environment

The project area is located northeast of Oro Grande, New Mexico (see Figure II-1). The vast majority of the survey area lies in the central basin zone. This section of desert is flanked by mountains and mesas. The east-west topography of the project area is depicted schematically in Figure II-2. The Jarilla Mountains to the west are a small, relatively low igneous mountain group surrounded by alluvial fans. Mule deer *(Odocoileus hemionus)* are common in the Jarillas as are plant species such as lechuguilla *(Agave lechuguilla)*, sotol *(Dasylirion wheeleri)*, and yucca *(Yucca elata)*.

Otero Mesa lies 8 km east of the survey area. The mesa supports a variety of plants and animals not found in the lower deserts. These include large, dense stands of grasses, a variety of succulents, desert willows *(Chilopis linearis)*, mule deer, and pronghorn *(Antilocapra americana)*.

The Sacramento Mountains are 25 to 30 km northeast of the study area. The Sacramentos are nearly 3,000 m in elevation and are a year-round source for a variety of resources, including deer, elk, wood, and water.

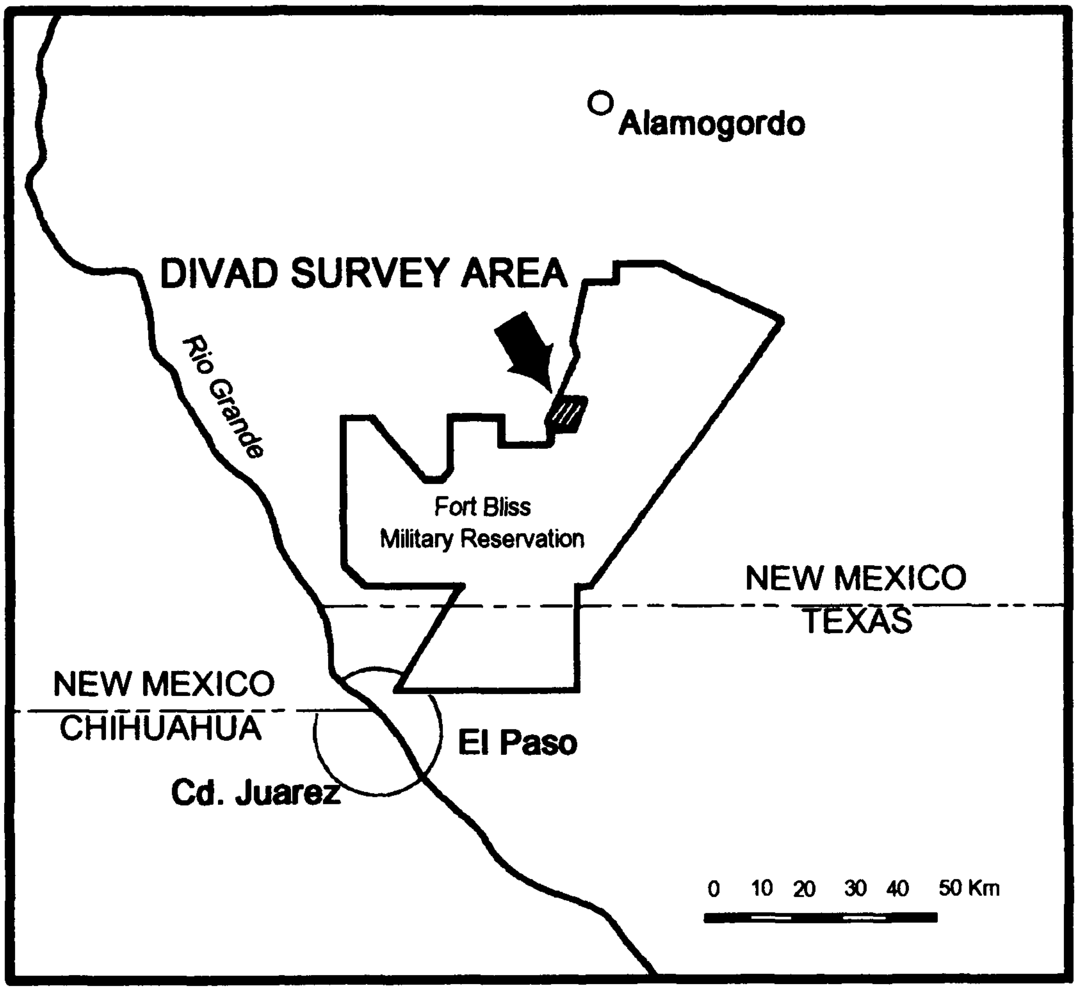

Figure II-1. DIVAD Survey Area and Fort Bliss Military Reservation

Sand dunes are common in the central basin. The prevalent plants include mesquite *(Prosopis juliflora)*, yucca, sage *(Artemisia filifolia)*, and snakeweed *(Xanthocephalum sarothrae)*. Cottontail *(Sylvilagus auduboni)* and jackrabbits *(Lepus californicus)* are plentiful in this zone.

Three major vegetation/soil associations can be identified in the survey area (see Figure II-3). A sagebrush/yucca complex, occasionally including mesquite, covers about 40 percent of the survey region. This complex is associated with sand, often in the form of high, unstable dunes. The second vegetational complex is composed of sagebrush, snakeweed, grass, and yucca. This complex covers approximately 50 percent of the survey area and occurs primarily in the western half of the study area. This second set of plants is distinguished from the first because it does not occur on high sand dunes. A tarbush *(Flourensia cernua)*/creosote *(Larrea tridentata)* complex comprises the survey area's final vegetation/soil association. In some instances, grasses co-occur with this complex. This third complex covers about 10 percent of the project area; it is associated with the lower ends of alluvial fans (PIC Study 1979:50-53; Satterwhite and Ehlen 1980:96-97). The interface between the lower alluvial fans and the eolian sands is quite active–surfaces often are exposed and buried. Much of the area covered by this tarbush/creosote complex is eroding at the present time.

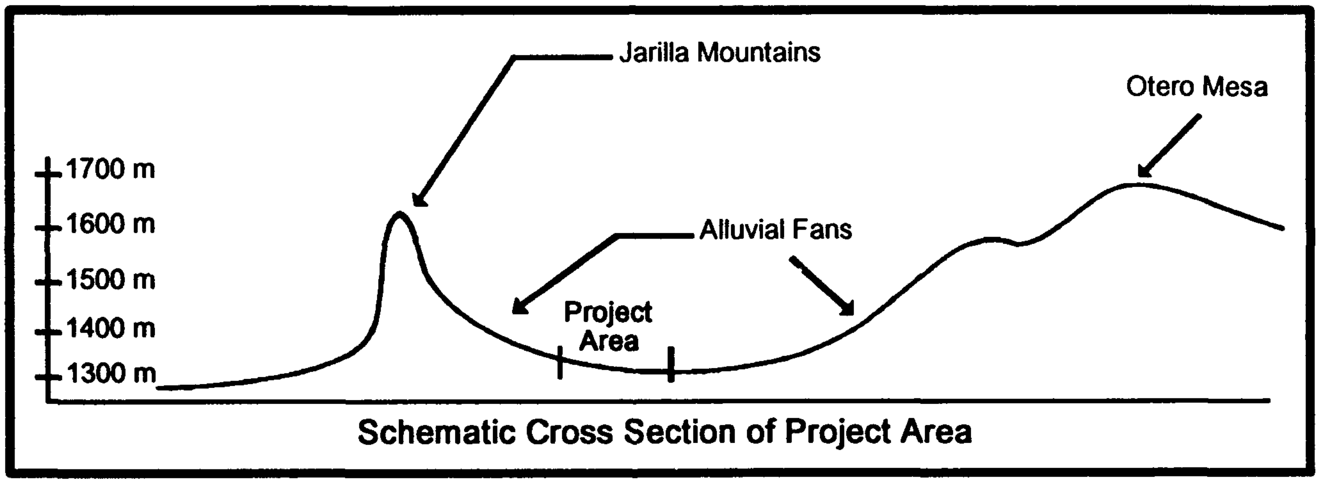

Figure II-2. Survey Area Schematic Cross Section–Adapted from Satterwhite and Ehlen (1980)

As noted earlier, soil moisture in the project area is a function of rainfall and runoff. Rainfall at Oro Grande averages 24.7 cm a year, 15 percent more than at El Paso (Reynolds 1956; United States Weather Bureau Records, El Paso Station). More than half of the annual precipitation at Oro Grande falls between July and September.

There are three drainage systems in the study area. A series of small arroyos terminate at the southeastern, northeastern, and southwestern edges of the survey block. The southeastern and northeastern sections of the survey area receive runoff from Otero Mesa. Similarly, runoff flows from the Jarilla Mountains to the western side of the survey region. The alluvial fans bordering the study area are dominated by silty soils. Particle size is small and water intake from runoff is high. Several geomorphological studies on Fort Bliss have demonstrated the lower alluvial fans have the highest soil moisture in the central basin (PIC 1979:53-55, 20; Satterwhite and Ehlen 1982:202-208, 1980:122). Consequently, plant resources are relatively abundant on the fans and may support a larger animal biomass.

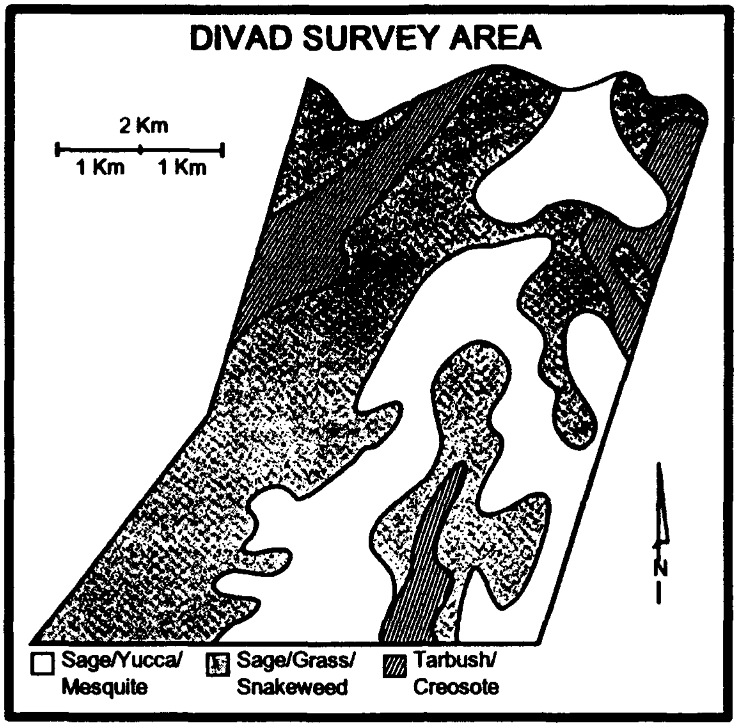

Figure II-3. Survey Area Vegetation/Sediment Associations

Soil characteristics, drainage features, and seasonal rainfall patterns suggest water would have been available for short periods of time at the base of the Jarilla Mountains and at the edge of the Otero Mesa fans in the northeastern and southwestern sections of the study area. Water has been observed collecting in these areas after heavy summer rainstorms. However, as the study area lacks a well-defined catchment zone and given that nearby mountain ranges are small, the volume of runoff also is small. It is unlikely substantial amounts of runoff water were available during the late fall, winter, or spring seasons.

In addition to these drainage systems, several playas are located in the northeastern section of the study area. These playas are fed primarily by localized rainfall, rather than mountain runoff. Consequently, the availability of water at the playas would be irregular. Standing water has not been observed at these playas.

Table II-1, derived from modern data, summarizes the seasonal and spatial distribution of plant and animal resources available in the project area. The table's four environmental zones are based on the environmental classification system discussed earlier. The DIVAD survey region does not contain a riverine zone.

Table II-1. DIVAD Region Spatial/Temporal Resource Variability

KEY: + = present ? = unknown – = very limited or absent

	Mountain Uplands	Alluvial Fans	Central Basin	Central Basin Playas
Late Summer				
Water	+	+	–	?
Deer	–	–	–	–
Rabbits	?	+	+	+
Mesquite	?	+	+	+
Cacti	?	?	–	–
Agave	–	–	–	–
Seeds	?	+	?	?
Fall				
Water	+	+	–	?
Deer	+	+	–	?
Rabbits	–	+	+	+
Mesquite	–	+	+	+
Cacti	–	–	–	–
Agave	–	–	–	–
Seeds	+	+	–	?
Winter				
Water	+	?	–	–
Deer	+	+	–	–
Rabbits	–	?	?	?
Mesquite	–	–	–	–
Cacti	–	–	–	–
Agave	–	–	–	–
Seeds	–	–	–	–
Spring/Early Summer				
Water	+	?	–	–
Deer	–	–	–	–
Rabbits	?	+	+	+
Mesquite	–	–	–	–
Cacti	–	–	–	–
Agave	?	+	–	–
Seeds	?	–	–	–

El Paso Area Cultural History

Paleo-Indian Period

Paleo-Indian populations are the earliest known human occupants of the El Paso area. Paleo-Indians were present from about 9000 to 6000 B.C. and are represented primarily by isolated finds of distinctive projectile points and open sites in the Tularosa Valley (Beckes 1977; Carmichael 1983; Krone 1975). The settlement and subsistence patterns of the period are better documented for other areas in the Southwest (e.g., Judge 1973). Data from these areas suggest Paleo-Indians formed small, highly mobile groups that ranged over large territories in pursuit of game. Plants were utilized as well. Population density during this period generally is thought to have been quite low. Carmichael (1983) provides an excellent summary of the scanty evidence on Paleo-Indian culture in the El Paso area.

Archaic Period

The Archaic (6000 B.C. to A.D. 250) in the El Paso area is better represented in the archaeological record. Reports on regional surveys (e.g., Carmichael 1983), cave excavations (e.g., Cosgrove 1947), and open-site excavation (O'Laughlin 1980) are available. A broad-spectrum adaptation based on hunting and gathering appears to have been established. There is evidence for sedentarism during certain periods of the year (Carmichael 1983; O'Laughlin 1980). In the later stages of the Archaic, possibly around 1500 B.C., corn began to be cultivated (Berry 1982; Ford 1985). During the Archaic period, population densities probably were greater and people lived in larger groups than during the preceding Paleo-Indian period.

Formative Period

The Formative period (A.D. 250 to 1400) is divided into two general subperiods, the Pithouse period or Mesilla phase (A.D. 250 to 1100), and the Pueblo period (A.D. 1100 to 1400). In turn, the Pueblo period is split into the Doña Ana or early Pueblo phase (A.D. 1100-1200), and the El Paso phase (A.D. 1200 to 1400). The Mesilla phase is distinguished from the Archaic by the use of pottery. Although true pithouses have been dated to the Mesilla phase (Lehmer 1948), most domestic structures associated with this phase are reminiscent of the earlier Archaic huts (Hard 1983a). Sites became larger during the Mesilla phase and many more Mesilla phase sites and artifacts have been identified than have their Archaic counterparts. These findings suggest Mesilla phase population was more dense than that of the preceding Archaic. Mesilla phase sites are present in all environmental zones (Carmichael 1983). Whalen (1978) suggests the phase was characterized by a generalized gathering, agricultural, and hunting economy.

The most intensive prehistoric use of the area occurred during the Pueblo period. This period is marked by more and larger sites, greater artifact densities, and a clustered settlement pattern (Carmichael 1983; Whalen 1977, 1978). Some pueblo sites in the region may contain more than 100 rooms (Brook 1970). While agricultural resources are thought to have become important during the period, wild plants and animals continued to play an important subsistence role (Bradley 1983; Foster et al. 1981).

Most Southwestern archaeologists agree upon this synopsis of prehistoric cultural development in the El Paso area. Recently, however, several researchers have questioned aspects of this cultural history scheme, suggesting it does not represent the prehistory of the area adequately. Whalen (1978, 1980) has argued the Doña Ana phase represents a short, transitional period between the generalized Mesilla phase adaptation and the more specialized farming cultures of the El Paso phase. Whalen postulates that although population growth was steady during the Doña Ana phase, prehistoric occupation of the region was most intense in the subsequent El Paso phase. Conversely, Carmichael (1983) argues that the region was occupied most intensively during the Doña Ana phase. That these opposing interpretations each find support is due to the difficulty in identifying Doña Ana phase components on sites that were occupied during both the late Mesilla phase and the early El Paso phase. Carmichael employs a more inclusive definition of the Doña Ana assemblage than does Whalen. Several of the sites recorded in the DIVAD survey could be classified as Doña Ana sites using Carmichael's criteria. Whalen, conversely, would have classified these same sites as multicomponent sites. The problems involved in defining and interpreting the Doña Ana phase will be discussed in more detail in Chapters IV and V.

Researchers also have questioned the validity of the entire cultural history sequence summarized above. They doubt it adequately describes the area's prehistory, particularly the later prehistoric periods (Carmichael 1985; Kauffman and Batcho 1983; Upham 1984). These archaeologists suggest the variability observed in the archaeological record, in part, is a function of competing adaptations. That is, agriculturalists and hunter-gatherers are thought to have occupied the area contemporaneously. Unfortunately, archaeologists have not developed methodologies capable of testing these propositions. In this report, the standard sequence of cultural phases will be employed. However, it will be used primarily for temporal, not functional, classificatory purposes.

Previous Research Near the Study Area

Prior to the DIVAD survey, no archaeological work had been undertaken in the study area. However, several survey projects have been conducted in the immediate vicinity. These studies identified large early Pueblo period sites to the south and southwest of the DIVAD project. These sites are associated with alluvial fans. Several alternatives have been suggested to account for this association, which has been observed elsewhere in the Tularosa Valley. Explanations based upon the agricultural potential of the alluvial fans (Whalen 1977, 1978), and, in the case of sites near the Jarillas, upon relationships with cultures in northern Mexico (Carmichael 1983) have been proposed. Little evidence for any pre-Pueblo occupation of the area around the DIVAD survey has been discovered.

The Texas Archaeological Survey (TAS) investigated six 36-mi.^{2} quadrants on McGregor Range in 1975. Quadrant 2 and quadrant 6 were surveyed just south and east of the DIVAD area, respectively. Unfortunately, the monograph describing the TAS survey (Beckes, Dibble, and Freeman 1977) does not present the results in a manner easily comparable either chronometrically or spatially to the results of the present research. However, several large pueblo sites were recorded on quadrant 2, south of the present survey area. The ceramic assemblage associated with these pueblos matches Lehmer's (1948) and Carmichael's (1983) Doña Ana phase assemblage. Quadrant 6, located principally on Otero Mesa, produced surprisingly few cultural remains.

Personnel of the Bureau of Land Management (BLM) conducted a survey of 832 acres near the southern end of the Jarilla Mountains and southwest of the study area (Way 1979). Alluvial fans extending from the Jarillas cover the entire area. Like other surveys in the Hueco Bolson (Carmichael 1983; Whalen 1977, 1978), the BLM survey identified large concentrations of Pueblo period sites in this general geomorphological setting. The BLM survey recorded 81 archaeological sites. On the basis of diagnostic ceramics, 50 of these were assigned to the Pueblo period. Only two Pithouse period sites were identified in this study, and the remaining sites consisted of nondiagnostic ceramic and lithic scatters (Way 1979).

Using Whalen's preliminary seriation of El Paso phase rim sherds (Whalen 1978), Way found that 42 of the 50 El Paso phase sites are dominated by early rim-form varieties. Early design styles–single bands of red or black paint running vertically from the rim–also were found on these sites. On three of the larger sites, Way documents the co-occurrence of early El Paso Polychrome with Mimbres Black-on-white, a ceramic type with a terminal date of about A.D. 1150 in the Mimbres area (Way 1979). Way suggests, based on ceramic cross-dating and the El Paso Archaeological Society's archaeomagnetic dating of the early El Paso Polychrome types, this early El Paso Polychrome dates from A.D. 1150 to 1250 (Way 1979:50). She hypothesizes that from the beginning of the Pueblo period, large pueblo sites were concentrated in runoff areas such as those associated with the Jarillas (Way 1979:51).

Carmichael's more recent survey work in Maneuver Area 3-8 on Fort Bliss has extended the concept of a "Jarilla Mountain Core Area" (Carmichael 1983). He has identified a cluster of large, dense sites near the Jarillas. Carmichael has assigned most of these sites to the Doña Ana phase (A.D. 1100 to 1200), a period essentially equivalent to Way's early Pueblo phase (Way 1979). Carmichael's survey recorded few pre-A.D. 1100 sites and few post-A.D. 1200 sites in this core area. He suggests the sudden occupation of the area at A.D. 1100 and its apparent abandonment by A.D. 1200 probably was brought about not by the agricultural potential of the area, an interpretation offered by Whalen for core areas in the southern Tularosa Valley (Whalen 1977, 1978), but by developments at Casas Grandes, a large site in northern Mexico. Carmichael suggests the use of the Jarillas was connected to the demand for minerals from Casas Grandes. Accordingly, the Jarilla Mountain sites were abandoned when the regional interaction sphere associated with Casas Grandes collapsed (Carmichael 1983:120-121,163-164; cf. Mauldin 1985).

Although there is little evidence that pre-Pueblo period groups were present in the vicinity of the DIVAD survey area, archaeological research has identified large early Pueblo period sites to the south and southwest of the DIVAD project area. These sites are associated with alluvial fans, and several alternatives have been suggested to account for this association. These suggestions include the agricultural potential of runoff slopes (Whalen 1977, 1978) and interregional relationships with people in northern Mexico (Carmichael 1983).

Chapter III

MODELING SETTLEMENT SYSTEMS

This chapter considers two complementary methods for investigating organizational properties of prehistoric systems. The first involves generating synchronic models of prehistoric cultural organization (e.g., Hard 1983b). The second considers the patterns of material remains that may result from the operation of several of these organizations through time, and explores factors that may condition long-term land use. These diachronic factors include changes in the scale of mobility, opportunities for scavenging, and the availability of resources. Several generalizations regarding the utility of these models will be proposed in this chapter: (1) for periods of high mobility and low mobility, test implications derived from synchronic models can be considered effectively; (2) for periods of moderate mobility, reoccupation may complicate a direct evaluation of synchronic models; (3) the seasonal predictability of natural resources was a crucial determinant of prehistoric reoccupation patterns; and (4) scavenging was most common in environmental zones that were reoccupied frequently. The implications of these propositions for the interpretation of the prehistoric occupation of the DIVAD study area are considered at the end of this chapter.

Synchronic and Diachronic Land-Use Models

Synchronic land-use models are hypothetical formulations of past cultural adaptations. They typically incorporate information about prehistoric adaptive systems and environmental variability as well as generalizations regarding the social and economic organization of prehistoric hunter-gatherers and agriculturalists (Hard and Mauldin 1986). The formulations require the development of models, the collection of empirical data, and, eventually, the reformulation of the models in light of ongoing research results. The models are used as heuristic devices to organize and integrate research; they are not statements of fact, nor are they explanations. Rather, it is hoped model construction and evaluation will lead to the eventual development of descriptive and explanatory schemes (cf. Hard and Mauldin 1986).

The Fort Bliss Historic Preservation Plan, discussed in Chapter I, argues that cultural adaptations represent a class of living systems that exchange energy and information with their social and biophysical environments. Elements of cultural systems are defined by repetitive activities. These activities should be archaeologically identifiable through variations in assemblage content and structure. The successful interpretation of the material record requires decoding the results of cultural and natural processes that impact artifact concentrations. Unfortunately, archaeology has only begun to develop the methodological tools with which to interpret the archaeological record unambiguously. In the absence of statements linking material remains, such as aspects of site location and assemblage structure and composition, to prehistoric organizational dynamics it is impossible to assess explanations of archaeological remains.

Attempts to develop criteria with which to recognize elements of different cultural systems have focused on variability in site location, ceramic assemblages, ground stone assemblages, architecture, faunal remains, and, to a lesser extent, lithic assemblages (e.g., Hard 1983b). Models based upon these criteria usually do not incorporate considerations of how archaeological patterns generated by successive land-use systems will obscure each other such that they no longer are spatially discrete and easily recognizable.

Hard has outlined a series of subsistence and settlement models for the Archaic period (Hard 1980). Detailed subsistence/settlement models have been constructed for the late Pithouse period (Hard 1983b) and the Pueblo period (Mauldin 1984; Scarborough 1986). Each of these models identify test implications. For example, in developing recognitional criteria for El Paso phase sites, it was suggested certain material items should occur on certain types of sites (Mauldin 1984). It was predicted that ground stone would be present on summer foraging sites–sites used to procure and process wild seeds and small game. Working from Hard's hypotheses regarding wild seed and corn processing (Hard 1983b), it was argued that the grinding surfaces of the ground stone tools found at summer foraging sites should be smaller than grinding surfaces at "primary village locations," where corn processing was a major activity (Mauldin 1984). While such a relationship may have been obtained at a given time in an ongoing cultural system, several processes could have operated to obscure or even destroy such associations. These processes include reoccupation by subsequent cultural groups, ground stone curation, and ground stone reuse.

This assessment does not suggest subsistence/settlement models are useless, but rather that the testability of the models will be related inversely to the frequency and extent of subsequent occupation of an area or site. It is necessary, therefore, to begin to model factors that may cause changes in reoccupation patterns, and to consider the effects these changes may have had on artifact assemblages and settlement location.

The following sections present an initial attempt to develop expectations for site locations and artifact assemblages that may have been generated by a series of behavioral and organizational systems. The resulting model considers how a region may have been used over a long period of time. This diachronic model relies on ethnographic sources. It focuses on several factors that may have affected the frequency and extent of reoccupation. This model is a first approximation; much work remains to be done.

Reoccupation and Mobility

Mobility is an important consideration in diachronic modeling. Changes in mobility strategies have been investigated by a number of individuals (e.g., Binford 1980, 1983a, 1983b; Kelly 1983; Thomas 1983; Vierra 1985). They have focused upon the relationship between the availability of natural resources and mobility strategies. In this report, resources will be defined broadly; and, the facilities, structures, and artifacts left on the landscape by previous inhabitants will be included in discussion.

The model designates five land-use zones; these zones are adapted from Foley (1981), Binford (1982), Yellen (1977), Thomas (1984) and Lee (1979). The five zones are not intended to be universally appropriate, but to provide a baseline for discussion. First, the "residential core" zone corresponds to a site used as a residential base. Second, the "foraging zone" is the area utilized on a daily basis to collect resources. The foraging zone roughly is 20 km in diameter, and surrounds the residential core. Third, the "logistical zone" surrounds the foraging zone. It is the area in which special-purpose tasks, launched from the residential camp, could have occurred. Sites in this zone probably represent overnight encampments. Fourth, the "annual range" consists of the territory utilized over the course of a year. This area may consist of a series of residential core/foraging/logistical zones. Fifth, the "extended range," also referred to as the "lifetime" range (Binford 1982), encompasses the entire area available for occupation. Extended ranges often are immense and may contain a series of annual ranges depending on the level of mobility. Extended ranges also may be utilized over a long period (cf. Vierra 1985).

The residential core, foraging zone, and logistical zone have different patterns of material deposition. A residential location will produce a variety of remains, will likely include features, and have a large number of artifacts. The foraging zone probably will contain isolated artifacts and cached tools. Because hearths and structural remains seldom should have been required in daily foraging activities, they should not be found in this zone. Conversely, sites in the logistical zone may be represented by hearths, structures, and substantial quantities of trash. Annual ranges may have had several such residential/foraging/logistical sets. The synchronic models of Archaic, late Mesilla, and El Paso phase land use discussed above essentially are accounts of the remains generated by cultural systems over their annual ranges.

Binford (1978, 1982, 1983a, 1983b), working with data on the Nunamiut Eskimo and other hunter-gatherer groups, discusses the potential complexity generated by different levels and types of movement in the annual range (see Vierra, 1985 for additional examples). Binford describes a pattern of residential mobility in which residential sites are positioned in areas that previously served as logistical zones. Logistical sites generated from the new residential core site may overlap with those produced at the previous residential core, and they also may be located in the previous foraging zone. When activities are conducted at these logistical sites located at the former residential core or foraging zone, mixtures of different assemblages will occur. These changes in land use obscure the relationships between land uses and artifact assemblages. Thus, sites and their assemblages cannot be used uncritically to test the implications of synchronic models of subsistence and settlement.

Changes in the size of the extended range, which may be generated by regional population growth or changes in subsistence, may influence the reuse of sites, and also result in different patterns in the reuse of artifacts, features, and structures. During periods of high mobility, the reuse of the same location probably was infrequent. Sites probably were occupied for a short period of time, with little reoccupation. Such a mobility/reoccupation pattern would not have resulted in the mixing of assemblages generated by different functional roles. For example, it is not likely a logistical site was used as a residential site during periods of high mobility.

Reoccupation should have increased as mobility decreased. A number of different factors could have caused mobility to decline. For example, increasing regional population densities would restrict movement. Changes in subsistence, with a greater focus on smaller game, the collecting of plant resources, and agriculture also may have resulted in decreased mobility. A number of cross-cultural studies (e.g., Murdock and Wilson 1980) demonstrates that as subsistence is focused on smaller game and plants, mobility declines. Whatever the cause of reduced mobility, a lowering in the level of movement over the landscape should result in annual ranges, previously abandoned for long periods, becoming occupied more frequently. It is during this period of moderate mobility that reoccupation of locations for different purposes is most likely.

When the extended range and annual range closely coincided and mobility was low, the frequency of reuse would have remained high, but the use of a specific site for different purposes is expected to have been less frequent. For example, it is unlikely logistical sites were reused as residential sites. During periods of low mobility or sedentarism, the generation of new residential sites would have been infrequent.

Both highly mobile and sedentary groups probably produced sites with high integrity. Highly mobile groups rarely reoccupied sites. Essentially sedentary adaptations would constrict reoccupation; sites with similar functional roles would be reoccupied for the same set of tasks. During periods of moderate mobility, reoccupation for different purposes would be most frequent and could result in the overlap of functionally distinct artifact assemblages.

Reoccupation and Environmental Predictability

Another set of conditions relevant to the amount and type of site reoccupation may be the predictability of critical natural resources. It is expected that the degree to which the locational availability of critical natural resources could be predicted from year to year would influence reoccupation, as well as investment in site structures/facilities, and overall site structure.

For example, Yellen (1977), working with the !Kung in the semiarid deserts of Southern Africa, has amassed data that demonstrate water is available at certain locations (e.g., Dobu water hole) throughout the year. Populations concentrate at these locations throughout most of the year to take advantage of the water. Elsewhere, water is present on a less predictable basis. Water may be available only once every 20 or 30 years in some areas. Frequent residential reoccupation should be minimal at these locations (see also Hitchcock 1982; Gould 1968, 1980).

It is expected that the most substantial structures, structures intended to be reused, would have been built at locations that offered predictable resources. Structures substantial enough to survive seasonal or yearly abandonment with minimal repair are suited to reoccupation. The reoccupation of extant structures may have resulted in greater investment in site maintenance, more formalized trash disposal, and spatially confined artifact distributions.

Locations providing a less predictable natural resource base are anticipated to have received smaller initial investments in structures and facilities. Minimal initial investment is a function of the low probability of returning to the location. Furthermore, low-investment structures, such as huts, probably deteriorated quickly, and their very deterioration may have discouraged their reuse. Given low-investment, rapidly deteriorating structures, it may have proved simpler to build an entirely new structure nearby rather than reoccupy the original dwellings. While the same general site area may have been reoccupied (a function of the settlement/subsistence system and environmental predictability), the probability of the structure itself having been reoccupied is low. This pattern of reoccupation should result in a different pattern of cultural remains. The use of the same area but not necessarily the same structure should yield a diffuse scatter of artifacts over a large area.

Scavenging

The final process important in the diachronic model is scavenging. The collection/reuse of artifacts from formerly occupied sites complicates testing of synchronic land-use models. The rate of scavenging should be a function of (1) the intensity of occupation and reoccupation and (2) the availability of usable material. Occupation and reoccupation, which may be related to overall mobility patterns and environmental predictability, influence scavenging by generating a supply of artifactual material and by placing populations in proximity to that material.

While the material remains generated by any single occupation of a location may be minimal, the regular, repeated occupation of spatially restricted locations, such as water holes, results in large artifact scatters. There is a high probability that artifacts, features, and structures at such locations were reused.

Areas that seldomly were reused–on the order of a few times a generation–will, conversely, offer few artifacts and short-lived structures. At these locations, scavenging should have been minimal because reoccupation was infrequent and the availability/visibility of artifacts was low. This suggests scavenging should have increased as mobility/reoccupation increased and that scavenging should have become more common over time.

Finally, note that all of the patterns discussed above are affected further by geomorphological processes. Erosion can create sites by collapsing diffuse–unrelated artifacts–onto a single surface, thus forming a dense scatter of material available for collection and/or reuse. Conversely, depositional processes can bury artifacts, making them unavailable for later use.

Complications for Testing Models

Reoccupation and scavenging have the potential to complicate tests of synchronic models. Frequency of reoccupation is a function of overall mobility and predictability of the environment. During periods of high residential mobility, the reuse of locations will be infrequent. In more sedentary systems, site reuse will be commonplace, but sites will be used for the same purposes again and again. The test implications of synchronic models can be evaluated relatively easily in either of these contexts. However, the vast majority of sites probably were produced by groups who used a series of annual ranges and whose level of mobility was between these extremes. During periods of moderate mobility it is likely sites were reoccupied for different activities. In such instances, testing of synchronic settlement models will be difficult.

Scavenging further complicates testing synchronic models of land use. Scavenging is contingent upon the presence of artifacts and their visibility, both of which are related to reoccupation and environmental predictability. At locations that were reoccupied frequently, locations with a predictable supply of critical resources, there should be a substantial number and variety of artifacts. The incidence of scavenging, therefore, should be a function of mobility and occupational history.

This model has stressed several processes that may have developed in a predictable manner over time and that may complicate testing synchronic models. These processes make it probable that not all sites will represent discreet aspects of prehistoric cultural systems and that not all cultural systems may be investigated easily using synchronic land-use models (cf. Hard and Mauldin 1986). Testing the implications of synchronic models will prove difficult for sites that are the result of the reuse of specific locations for different activities. Such locations may have assemblages that represent the combination of several different functional roles. Scavenging further complicates evaluation of the models. Sites located in environmental zones that frequently were reoccupied are likely to have been scavenged. However, by developing insights into reoccupation and scavenging patterns, we can begin to assess the effectiveness of synchronic models and identify the circumstances under which other research avenues must be pursued.

DIVAD Area Artifact Patterns, Site Characteristics, and Reoccupation

A consideration of the diachronic aspects of site reoccupation within the DIVAD study area leads to a number of expectations about overall occupational intensity, site location, and site characteristics. It is expected that the small, highly mobile bands that represented the Paleo-Indian and Archaic cultures left little evidence of their presence. Use of the study area probably increased as mobility decreased and population grew during the Mesilla phase. The El Paso phase likely produced the most regular land-use pattern; structures were more likely to have been reoccupied and trash disposal formalized. The degree of sedentarism during the El Paso phase, however, is unclear. Residential mobility may have been moderate throughout the period, complicating tests of the synchronic models developed for the El Paso phase (Mauldin 1984).

We can use these probable changes in the scale of land use and investigate the spatial distribution of cultural remains in the study area. While a variety of flora and fauna is available near the present survey area, the distribution of resources within the DIVAD area itself is limited. The lack of environmental diversity makes it unlikely that the full range of site types was used at any given time in the DIVAD study area. Plant productivity in semidesert environments, as noted above, primarily is a function of soil moisture. Water may have been available consistently only during the late summer and fall, and then only near the alluvial fans extending from the Jarillas. Plant resources also may have been concentrated here, as well as on the alluvial fans associated with Otero Mesa. Only the fans from the Jarillas, however, could support long-term residential sites. These sites probably were used principally when water was present: late summer, fall, and, possibly, early winter.

The fans extending from Otero Mesa into the study area are a considerable distance from the mesa. This section of the study area would be less likely to receive substantial runoff, and, therefore, less likely to provide standing water for substantial lengths of time. While the sediments of the Otero Mesa fans are well suited for economically important plants, their lack of surface water makes it less likely that they supported substantial residential occupations.

The intensively used residential sites of the Jarilla fans may have been surrounded by a zone of more limited use. This latter zone comprised a foraging radius; it is archaeologically identifiable by isolated finds and small sites with limited varieties of features and artifacts and with low artifact densities. The portion of the study area that lacks water, the central zone, probably was part of the foraging zone.

The study area also probably contained a logistical zone. The playas away from the lower alluvial fans probably only held water during the late summer, and then on an unpredictable basis. Given the expectations identified above, these areas probably were used primarily for logistical activities. The Otero Mesa fans also may have been used for logistical purposes, although reoccupation probably was quite infrequent.

The lower alluvial fans of both the Jarillas and Otero Mesa probably were occupied repeatedly, and the pattern of material remains in these areas may have been complicated both by the intermingling of assemblages and by scavenging. Reuse of sites as sources for materials probably was common, particularly during later periods as site densities increased and usable materials became more plentiful.

Summary

This chapter has explored several factors that may condition changes in the details of land-use systems. Characteristics of prehistoric mobility, reoccupation, and scavenging affect the ease with which synchronic models can be tested. Consideration of these processes in the DIVAD study area suggests the lower alluvial fans associated with the Jarillas, and to a lesser extent those extending from Otero Mesa, may have been used intensively during all prehistoric cultural periods. The Jarillas probably supported residential sites that were surrounded by foraging zones. It also is expected that logistical sites are present in the study area. Given the intensive use of the alluvial zones, there is a high probability that assemblages from different occupations overlap. The frequency of scavenging in the area also may complicate assemblage composition and interpretation.

Chapter IV

SITE DESCRIPTIONS AND DISTRIBUTIONS

This chapter describes the 69 archaeological sites recorded in the DIVAD survey. Data on site size, ceramic density and type, ground and chipped stone artifacts, and the number of hearths are presented in Appendix A. All artifacts and survey records are curated at the Environmental Management Office on Fort Bliss.

As discussed in Chapter III, archaeological research on Fort Bliss has developed synchronic land-use models for specific cultural periods. It was argued that testing synchronic land-use models is easiest for periods characterized by either extremely high or extremely low mobility. Moderate mobility patterns, however, cause earlier sites to be reoccupied for different purposes. As a result, links between activities, organizational roles, and artifact assemblages or site locations are obscured for periods of moderate mobility. Some of the variables that may influence reoccupation and scavenging patterns were outlined in the previous chapter. These included the overall level of mobility, the predictability of natural resources, and opportunities and access for scavenging.

The spatial distribution of sites in the survey area has four clusters, one in each corner of the 35-km^2 survey area. The next section considers site locations relative to soil/vegetation zones. Geomorphological and mechanical processes (e.g., road grading) seem to be a major element in determining site visibility within each of these four site clusters.

The temporal placement of sites, discussed later in this chapter, is based primarily on the results of ceramic analysis. Chronometric dates are available for seven sites in the northeastern section of the DIVAD survey and for a single site in the southwestern section of the survey. The temporal patterning of the prehistoric use of the survey region is discussed in a later section in this chapter. It is suggested that while Preceramic occupations may have been present, occupation of the study area was most intensive during the Formative period.

Site Visibility and Spatial Distribution

Artifact and site visibility is affected by deposition and erosion. As noted in Chapter II, the survey region is characterized by a variety of soil/vegetation associations ranging from deep sand ridges in the central area to alluvial fans on the eastern and western sides. These soil/vegetation associations result from different geomorphological processes. Geomorphological processes can have a number of effects on the archaeological record: First, erosion can collapse low-density artifact scatters, deposited over several hundred or even thousands of years, onto the same surface, creating concentrations of unrelated artifacts that will be recorded as single sites; second, deposition can obscure sites by covering up prehistoric surfaces and making the sites invisible to archaeological survey crews; and, finally, these processes, especially in areas dominated by sand dunes and blowouts, can provide isolated glimpses of the underlying artifact distributions. While most researchers have noted these effects, there have been few attempts to deal with these problems in any systematic manner (cf. Carmichael 1983).

A comparison of the overall distribution of sites with the drainage patterns and soil/vegetation soil zones discussed in Chapter II suggests there are strong relationships between site location and drainage and between site density and soil/vegetation zones. As shown in Figure IV-1, the 69 sites form 4 clusters, one at each corner of the survey region. Sites are clustered at the terminal ends of drainage systems in the northeastern, southeastern, and southwestern parts of the survey area. Three of these clusters are near alluvial soils. The northwestern cluster is not associated with alluvial soils.

The pattern of sites at the base of alluvial fans has been identified previously (e.g., Whalen 1977). The relative abundance of sites in these settings has been assumed to be principally a function of prehistoric adaptive strategies. This distribution in the DIVAD area may have adaptive significance; however, the comparatively large number of sites discovered near alluvial fans in several sections of the study area also may be a function of geomorphological processes.

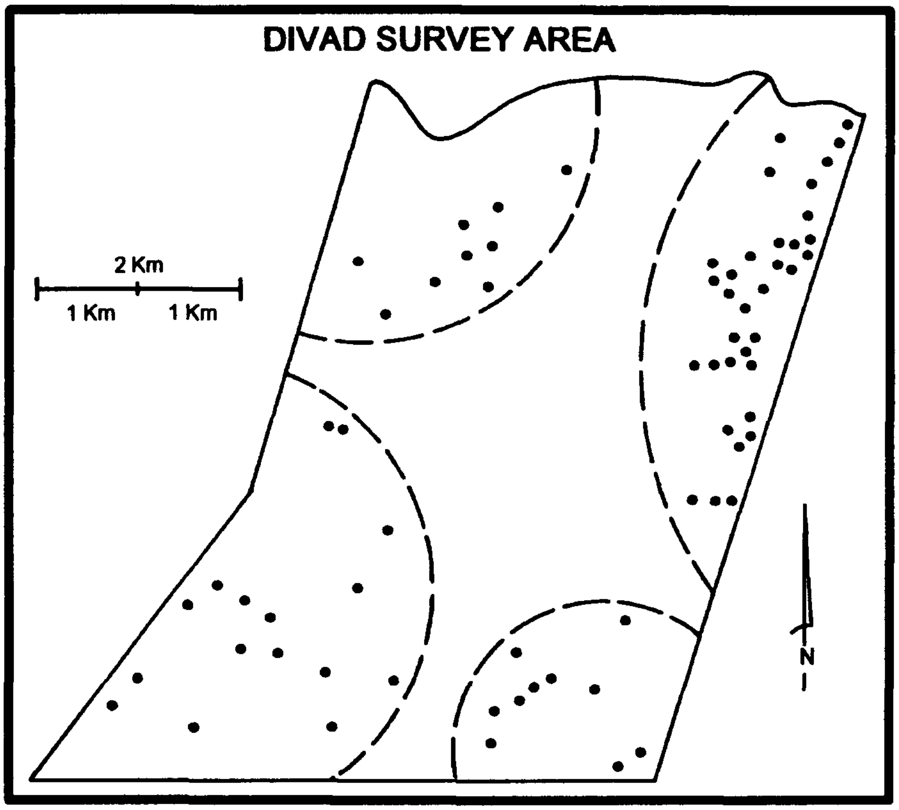

Figure IV-1. Site Distribution

Figure IV-2 shows the distribution of sites relative to the soil/vegetation zones discussed in Chapter II. The distribution suggests a strong positive spatial correlation between the relative number of recorded sites and the tarbush/creosote vegetation complex . This soil/vegetation zone covers only 10 percent of the survey area yet contains 33 percent of the sites. The tarbush/creosote complex is an active surface subject to erosion (Satterwhite and Ehlen 1980). Therefore, the relatively high density of sites in this vegetation zone simply may be the result of exposure. For example, some parts of site FB5000, located in the northeastern part of the survey region, are being damaged by erosion. Creosote clumps in the area often are elevated 20 to 30 cm above the surrounding ground surface, anchored in place by exposed roots. Other portions of the site, some buried below 40 cm of deposition, have been exposed in the walls of arroyos that cut through the area.

The site distributions shown in Figure IV-2 also suggest there is a disproportionately small number of sites in areas dominated by the sage/yucca/mesquite complex. The relative lack of sites in this complex also may be the product of geomorphic processes. Sand in the central portion of the survey area forms a series of high dunes and sand sheets that sometimes are several meters thick. Near the edges of the complex the sand is shallower, and small, localized deflated areas, blowouts, are frequent. Most of the sites found in this complex are located near the edges of the sage/yucca/mesquite vegetation zone (see Figure IV-2). Furthermore, these sites consistently are exposed in blowouts. Two of the sites in the northeastern site cluster were exposed by road cuts 20 to 40 cm below the surrounding sands.

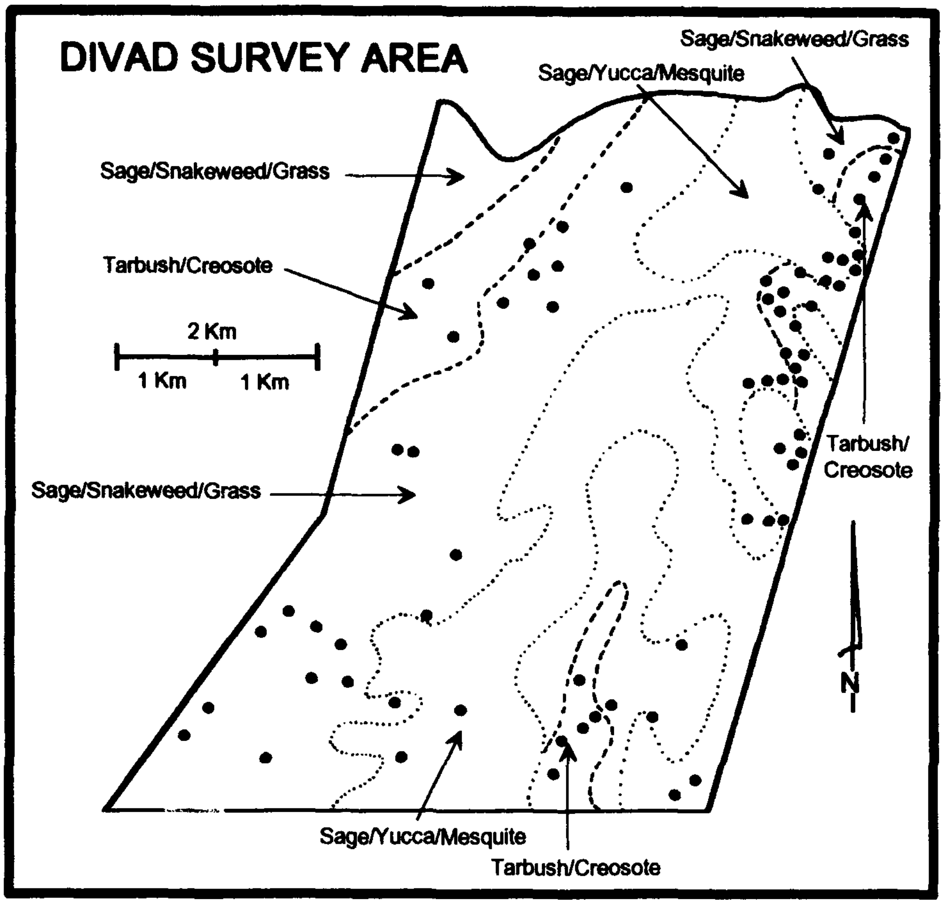

Figure IV-2. Vegetation Zone Site Distribution

Therefore, the small number of sites recorded in the central basin may be a function of natural, rather than prehistoric cultural processes. The relatively high number of sites recorded near the edges of the survey area may be a function of sites being buried in the center of the survey region coupled with increased exposure on the alluvial fans. It may be the case, however, that the concentration of sites at the perimeter of the study area is partially or entirely the result of cultural processes. The areal variation of environmental resources may have influenced prehistoric settlement patterns. As argued in Chapter II, there is evidence that soil moisture is a primary determinate in desert productivity, and that soil moisture is highest at the base of alluvial fans. There also are data, presented in Chapter II, which suggest that the availability of water may have been limited in the central part of the survey area. The relative effects of geomorphology and the availability of water cannot be assessed with the current survey data. The following two sections will discuss the temporal patterning of sites in the study area. The possibility that the difference in site density between the alluvial fan settings and the central basin may have adaptive significance will be discussed in more detail later in this chapter.

Temporal Site Assignment

The temporal placement of sites in the DIVAD survey area primarily is based upon ceramic data. Twenty-seven of the 69 sites (39 percent) could not be assigned to an established temporal period. Seventeen of these sites are aceramic sites. These 17 sites might represent preceramic occupations, functionally specific occupations associated with ceramic period cultural systems, or occupations generated by cultural systems that were contemporary with ceramic cultures but using a different resource base (cf. Kaufman and Batcho 1983). It would be very difficult to evaluate the relative likelihood of these possibilities. The other 10 sites had ceramic assemblages consisting entirely of brown ware body sherds. Brown ware body sherds were produced throughout the Formative period but cannot be differentiated by phase. Therefore, these 10 sites are assigned to the general Formative period.

The presence of El Paso Brown rims was used to assign sites to the Mesilla phase. Seventeen Mesilla phase components were identified by the presence of El Paso Brown or Mimbres sherds. Six of these components were on sites that also contained El Paso phase material. The data did not allow the spatial separation of El Paso phase from Mesilla phase material on four of these six sites. These four sites are termed multicomponent rather than Doña Ana phase and they are dated to between A.D. 750 and 1400. Six of the remaining 13 Mesilla phase components without Mimbres were assigned further to the early Mesilla phase (A.D. 300 to 750). Seven that also had Mimbres were assigned to the late Mesilla phase (A.D. 75 to 1150).

El Paso Polychrome is the primary ceramic type used to assign sites to the El Paso phase. Thirty-one El Paso phase (A.D. 1100 to 1400) components were identified by the presence of El Paso Polychrome, Chupadero Black-on-white, Three Rivers Red-on-terra cotta, or other late intrusives. On 25 sites, only El Paso phase material was found. As noted above, two sites contained spatially distinct El Paso phase and Mesilla phase materials. Four sites produced El Paso and Mesilla phase materials that could not be separated; they are classified as multicomponent sites.

No attempt has been made to identify Doña Ana phase components (A.D. 1100 to 1200). This phase virtually has been ignored since its introduction into the literature by Lehmer (1948). Carmichael (1981, 1983) defines the Doña Ana phase by the co-occurrence of El Paso Polychrome (A.D. 1150 to 1400), El Paso Brown (A.D. 300 to 1150), Chupadero Black-on-white (A.D. 1150 to 1400), Mimbres Black-on-white (A.D. 750 to 1150), and a variety of lesser types. He (1983) argues that the presence of this ceramic assemblage in 20 "midden contexts" demonstrates the phase's authenticity. Using Carmichael's criteria, the four sites classified above as multicomponent would be assigned to the Doña Ana phase. Note, however, that several of the sites in the DIVAD area where both Mimbres and Chupadero have been recorded also contain modern glass, plastic spoons, and rusting cans. These modern artifacts clearly postdate the occupations of archaeological interest, yet they occur on the same surface as the Mimbres and Chupadero ceramics that "define" the Doña Ana phase. As will be discussed in Chapter V, the spatial association of these two ceramic types is not sufficient to assign sites to the Doña Ana phase, especially given the location of such sites along alluvial fans subjected to reoccupation and to the action of geomorphological processes.

Using ceramics from the surface of sites to assign sites to prehistoric periods has several drawbacks. For example, negative evidence, the absence of Mimbres, is used to assign sites to the early Mesilla phase; yet there is no reason to think all late Mesilla sites "should" have Mimbres ceramics. In addition, 27 of the 69 sites could not be assigned to any established period because of a lack of ceramics. These problems are inherent in survey data from the region. Several seriation studies dealing with variation in rim forms and other studies of the diversity of lithic raw material types may help to resolve aspects of these dating problems (Carmichael 1983; West 1982; Whalen 1980). Additional work will be required before these techniques can be applied widely in the region: There is a dearth of independent data, and the processes that account for these changes, which may have chronological utility, are unknown.

In order to evaluate the temporal assignment of DIVAD survey sites, radiocarbon and obsidian hydration dates from several excavated sites in the northeastern portion of the survey are presented in Table IV-1. Sample data are available in Appendix A. All radiocarbon samples are from excavated contexts while the obsidian samples are from the surface. Table IV-1 provides a list of sites, their ceramic placement, and the chronometric results.

The table indicates the chronometric dates for two of the seven sites, FB5000 and FB5016, fall outside the expected temporal range. In both cases, however, the dates are within 50 years of the expected range. The Mesilla phase date from FB5002, a site without ceramics, suggests the site may represent a functionally specific location. These chronometric data, then, indicate the general temporal assignment of sites on the basis of surface material provides at least a rough temporal framework against which to consider changes through time.

Table IV-1. Survey Site Radiocarbon and Obsidian Hydration Dates

Site	Suggested Date Based on Ceramics	Corrected Radiocarbon*	Obsidian Hydration**
5000	A.D. 250-1150	A.D. 980-1190	A.D. 1200 ± 30 A.D. 1192 ± 12
5002	?	A.D. 868-999	
5007	A.D. 250-1400		A.D. 894 ± 53
5010	A.D. 250-1400		A.D. 856 ± 49
5012	A.D. 250-1150	A.D. 784-987	
5016	A.D. 250-1150	A.D. 126-232	
5019	A.D. 250-1150		A.D. 887 ± 81

* *Beta Analytic sample numbers are provided in Appendix A. These are corrected dates using the Stuiver and Becker (1986) program. The range represents one sigma.*

** *Mohlab sample numbers are provided in Appendix A.*

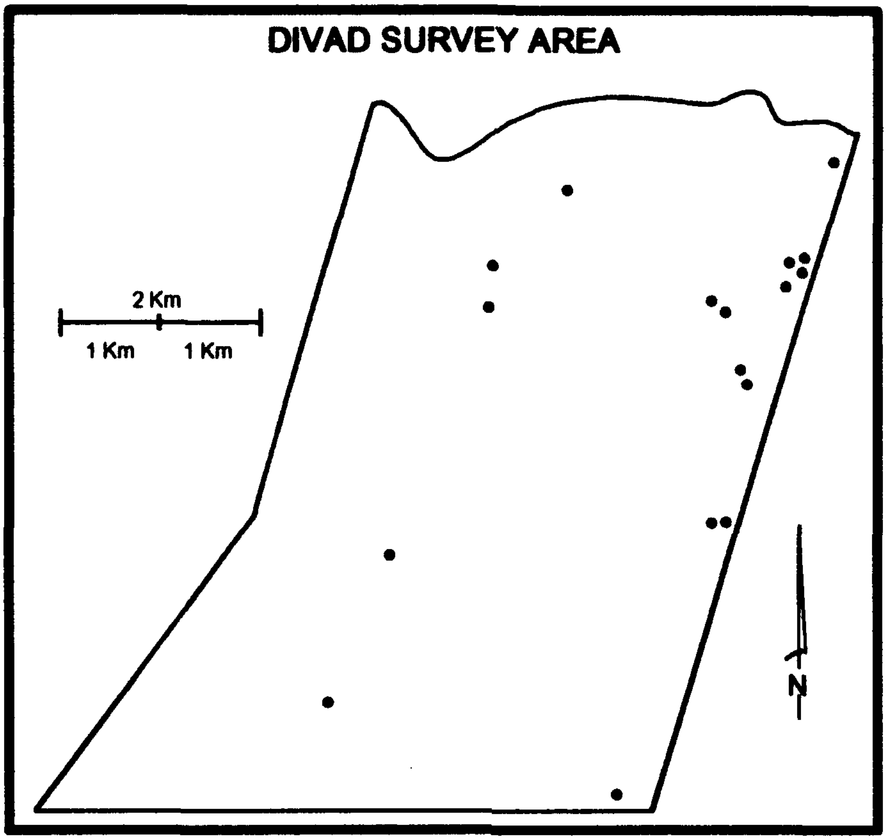

Figure IV-3. Aceramic Site Distribution

Temporal Trends Across the Survey Area

Using the chronological information discussed above, this section considers temporal changes in land use in the survey region. Two trends in the survey data are noted: First, that the spatial pattern of site location changed through time; and, second, the overall occupational intensity in the region, measured as the total site area assigned to each phase adjusted for phase length, increased over time.

The spatial arrangement of aceramic and unassigned ceramic sites suggests they are spread throughout the four sections of the survey area. Conversely, occupation during the late Mesilla and El Paso phase was concentrated on the alluvial slopes.

Overall site size per year, the sum of the site area produced during a phase divided by phase length, indicates occupational intensity was highest during the El Paso phase, though the area also was used intensively during the late Mesilla phase. There are no clear cases of pre-Formative occupation in the DIVAD survey area.

Figures IV-3 through IV-6 depict the spatial distribution of prehistoric components in the survey region by time period. The distribution of aceramic sites (see Figure IV-3) is similar to that of the overall site distribution–aceramic sites are located in all four corners of the survey region. Generally small in size, these sites average 0.12 ha and range from 0.01 to 0.48 ha. The total occupation area is 2.04 ha.

Unassigned ceramic sites occur in a more spatially restricted pattern (see Figure IV-4). There are clusters of these sites in the northeastern and northwestern sections of the survey area. There are no such sites in the southern section. These sites are somewhat larger than the aceramic sites–they have a mean size of 0.36 ha and range in size from 0.01 to 0.72 ha. The total occupation area for these sites is 3.60 ha.

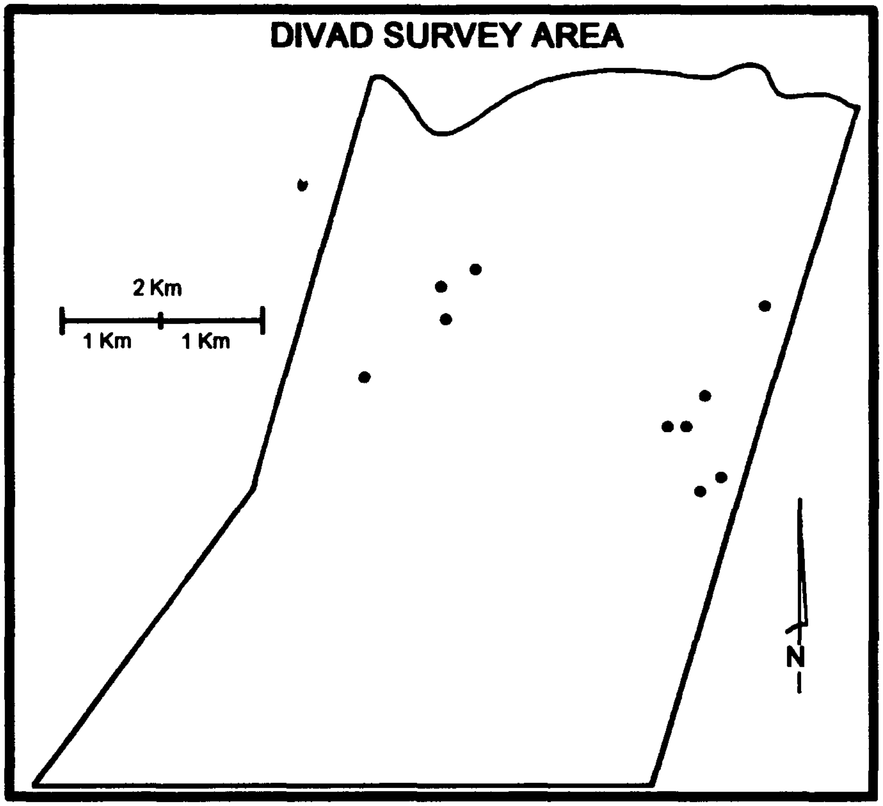

Figure IV-4. Unassigned Ceramic Site Distribution

The distribution of Mesilla phase sites is shown in Figure IV-5. Sites of this phase evidence a dramatic increase in size compared to earlier sites, and they have a relatively restricted spatial site distribution. The mean size of the 11 Mesilla phase sites and two spatially distinct Mesilla components is 1.99 ha. Combined, these sites and components occupy more than 25.8 ha. Most of this area is accounted for by three sites. An early Mesilla phase site in the northwestern section is estimated at 10.0 ha, and two late Mesilla phase occupations in the northeast and southwest sections measure 4.5 ha and 6.0 ha respectively. The late Mesilla phase components are located on the borders of the survey area, adjacent to alluvial fans. The southeastern section of the survey area lacks sites that can be assigned to the Mesilla phase.

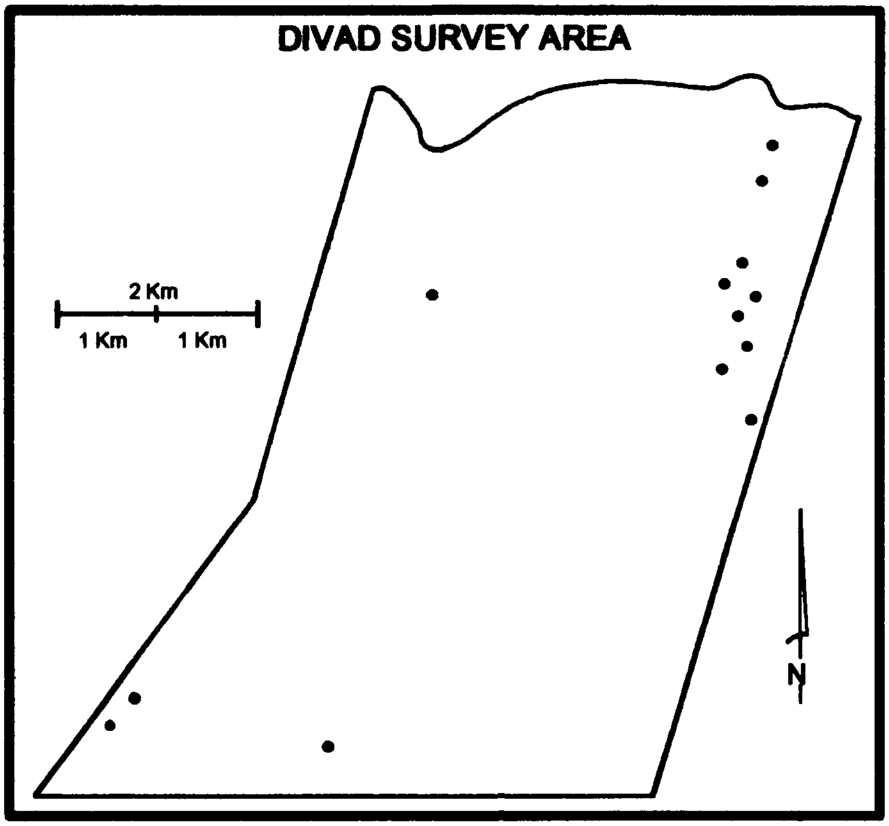

Figure IV-5. Mesilla Phase Site Distribution

Figure IV-6 depicts the locations of 25 El Paso phase sites, two spatially distinct El Paso phase components, and four multicomponent sites. These sites tend to be concentrated in the southeastern, southwestern, and northeastern sections of the study area. They are significantly smaller than Mesilla phase sites. Mean site size for the 27 El Paso phase components is 0.65 ha; site size ranges from .01 ha to 4.2 ha. The total occupation area for the El Paso phase sites is 17.5 ha. The four multicomponent sites occupy 4.57 ha, and average 1.14 ha in size.

A variety of methods are available to assess the level of prehistoric occupational intensity. These methods include calculating average site size (e.g., Whalen 1977) and determining the number of components produced per year (Carmichael 1983). In this study, occupational intensity was estimated by calculating site area produced per year. Total site area was obtained by summing the area of sites assigned to a phase. Total area then was divided by phase length, yielding a measure of the amount of site area generated per year. A number of factors may cause variability in this measure, including changes in mobility patterns, activities at sites, and population changes. All of these will affect changes in occupational intensity, and while separate measures for each would be ideal, they are not available. The total occupation area per year, therefore, will be used to compare the relative intensity of prehistoric occupation through time.

Dividing the total occupation area for the early Mesilla phase (13.6 ha) by its 500-year length (A.D. 250 to 750), an average of .027 ha of site area was produced per year. The average amount of site area produced annually during the late Mesilla phase (A.D. 750 to 1100) was .035 ha (12.3 divided by 350). This is a 30-percent increase over the previous period. The annual site area produced during the El Paso phase is .058

ha (site area = 17.5 ha, phase length = 300 years), a 66-percent jump over the late Mesilla phase. Comparison of overall site area per year by phase, suggests occupational intensity was highest during the El Paso phase. A gradual increase in occupational intensity apparently occurred from the early Mesilla phase through the El Paso phase.

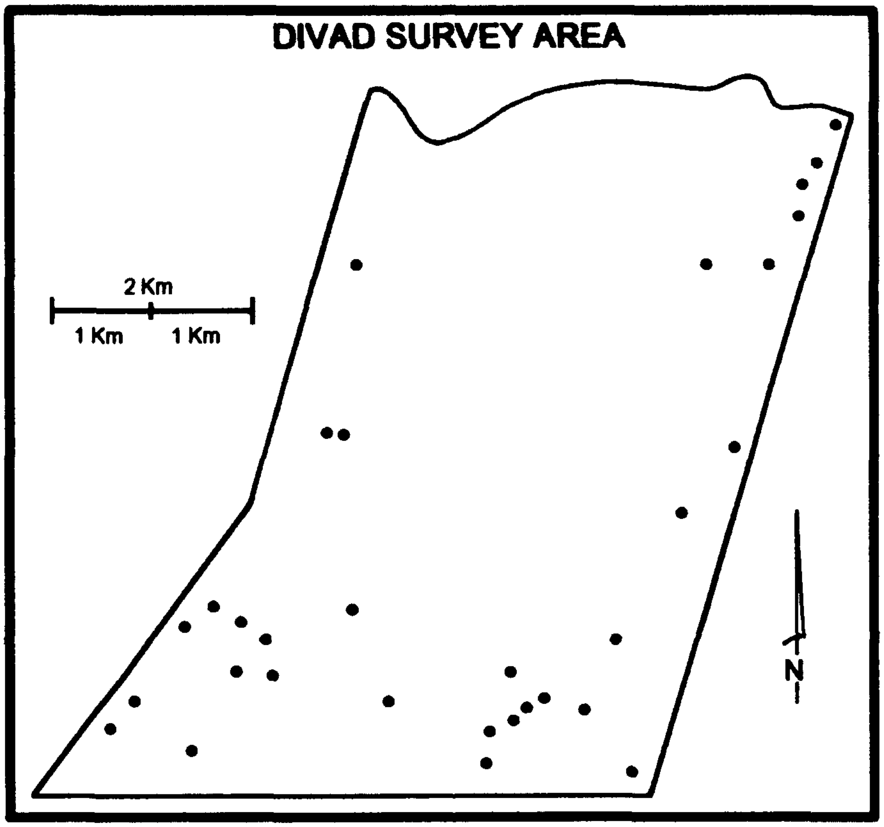

Figure IV-6. El Paso Phase and Multicomponent Site Distribution

Diachronic and Synchronic Patterning

In this section, the distribution of sites in the DIVAD survey region is interpreted in terms of the diachronic processes outlined in the previous chapter. Using ceramic variety and density as a measure of occupational intensity, it is argued that (1) the several large sites at the base of the Jarilla Mountain alluvial fans in the southwestern section of the study area that are surrounded by small, low-density sites may represent a residential core/foraging zone as described in the previous chapter; (2) the pattern of large, low-density artifact scatters in the northwestern section of the study area may be evidence that this area may have been used over a long period of time at a low intensity; (3) the small, primarily El Paso phase sites in the southeastern sector may represent the repeated, but more intensive, use of specific locations; and (4) the northeastern section provides evidence of a low-intensity occupation pattern both prior to and after the late Mesilla phase, a period when a more intensive land-use system may have been adopted.

In the following discussion of the major settlement clusters (see Figure IV-1), ceramic density and variety will be used as gross indicators of occupational intensity. Sites that have both high ceramic densities and more than one ceramic type will be designated "intensively occupied" sites. High ceramic density is defined arbitrarily to be more than six sherds on any square meter of the site. Table IV-2 demonstrates that site size, the estimated number of hearths, and the percentage of sites with ground stone all tend to increase as ceramic density and variety increase. Such a relationship would be expected if ceramic density, in fact, generally is indicative of occupational intensity.

Table IV-2. Occupational Intensity and Site Characteristics

No. of Sites	Ceramic Density*	Mean No. of Types	Mean No. of Hearths	Percentage with Ground Stone	Average Size
34	0-6 per m^2	1.6	3	76	.79 ha
8	6-20	3.4	3.5	75	0.34
9	21-50	4.3	3.7	78	1.88
1	50+	6	8	100	4.5

* *Estimated maximum ceramic density observed on the site survey.*

The northwestern cluster of nine sites consists of one El Paso phase site, one early Mesilla phase site, four unassigned ceramic sites, and three aceramic sites. The single El Paso phase site lacks ground stone, chipped stone, or hearths. It is .01 ha in size and has a ceramic density of 21-50 El Paso Polychrome sherds per meter. There are no other ceramics on the site. This site may represent a pot drop. Three of the eight remaining sites also lack ground stone, a trait shared by only twelve of the sixty sites outside the northwest cluster. The Mesilla phase site and the four sites with only undifferentiated brown ware present are characterized by maximum estimated ceramic densities of less than 6 sherds per m^2 and all have only one ceramic type present. Revisitation of the single large site in the northwestern cluster revealed the site is composed of a series of discrete, low-density scatters of ceramics, lithics, and fire-cracked rock (FCR). The scatters are similar in size and content and are separated by large areas that are almost barren of artifacts.

As discussed in Chapter III, such large sites consisting of several localized but low-density artifact scatters may be the result of an area, rather than a site, being used repetitively over a long period of time. Reoccupation may have characterized the northwestern section of the DIVAD area where the remains document use during the early Mesilla phase. If structures were present at the sites in the area, they probably would have been the shallow, basin-shaped huts that characterized the Mesilla phase (Hard 1983a; Whalen 1977), and it is unlikely they survived for any period of time after being abandoned. When sites were reoccupied, new structures probably were built. Artifact reuse by reoccupying groups also may contribute to the low-density artifact smears that characterize the large Mesilla site in this northwest cluster.

Occupation in the southeast section of the survey area is represented by 10 sites which date primarily to the El Paso phase. Eight of the sites have only El Paso phase ceramics, one is a multicomponent site and one is an aceramic site. This zone contains 30 percent of all El Paso phase components and contains 43 percent of intensively occupied El Paso phase components. While the southeastern sites tend to be small, averaging 0.37 ha in size, ceramic density and variety measures indicate they were occupied intensively (see Table IV-2). Hearths, ground stone, and chipped stone are common at these locations. Apparently, the prehistoric use of this area began abruptly during the El Paso phase. No earlier material was discovered there.

The size and distribution of the southeastern sites may be related to Pueblo period occupations outside the study area, such as those to the south and east identified by the TAS survey project (Beckes, Dibble, and

Freeman 1977). The small, intensively used sites recorded for the southeastern section of the DIVAD survey may represent the repeated, short-term use of specific locations during the El Paso phase. Elsewhere, I have suggested El Paso phase adaptations in the region may have used the central basin area on a short-term basis. The sites in the southeastern section may fall into the "secondary" site class identified previously (Mauldin 1984). As such, they should represent late summer-fall sites used during collection of central basin resources.

The northeastern section of the study area was occupied continuously from the early Mesilla phase through the El Paso phase. The section contains 34 sites, of which 11 are aceramic, 6 are unknown ceramic sites, 9 are Mesilla phase sites, 5 are El Paso phase, and 3 are multicomponent. Sites in the area may have been utilized on a short-term basis and frequently reused. This is suggested by the frequency of ground stone and hearths, along with the fact that the vast majority of sites (85 percent) are classified as low-intensity occupations using the ceramic criteria. The presence/absence of ground stone in the project area is shown in Figure IV-7. Note that 29 of the 34 sites in the northeastern section (85 percent) have ground stone remains, compared with 63 percent of the sites in the three other zones. In addition, 85 percent of the northeastern sites have hearths while only 66 percent of the sites in the rest of the survey region have such features. Many of the 34 sites are found in blowouts and consist of isolated hearths associated with small quantities of ceramics, lithics, and ground stone.

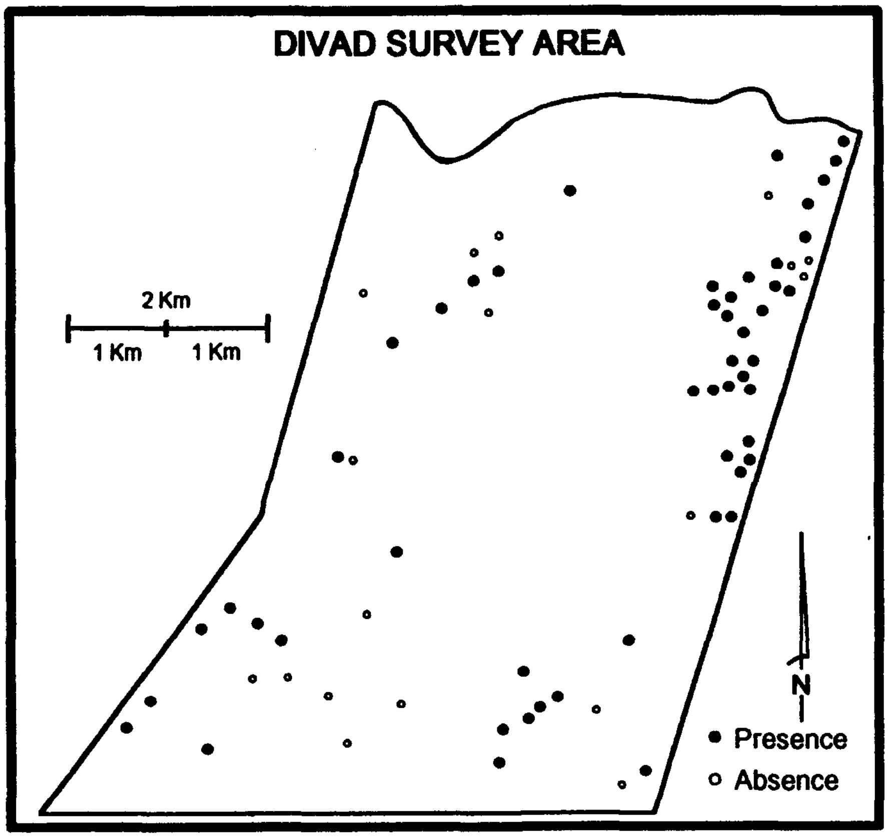

Figure IV-7. Ground Stone Presence/Absence by Site

Five of the thirty-four northeastern sites exhibit evidence of intensive occupation as defined by the ceramic criteria presented in Table IV-2. Two late Mesilla sites show evidence of high occupational intensity. One of the sites covers 4.5 ha, the other only 0.2 ha. On the larger of the two sites, subsurface structures are visible. Two multicomponent sites and one El Paso phase site also are classified as having been occupied intensively. These three sites together occupy a small area (2.6 ha); the El Paso phase site measures only 0.48 ha. Given the pattern of low-intensity site occupation prior to A.D. 750, the intensively occupied late Mesilla phase sites may represent a shift to a more intensive use of the northeastern section of the DIVAD survey region at about A.D. 750. Although located at the base of the Otero Mesa alluvial fans, the level of intensity evidenced by these late Mesilla phase sites was not expected given the distribution of water and resources presented in Chapter II and discussed in Chapter III. The small El Paso phase sites characterized by low ceramic densities and little ceramic variety indicate the area may have been used again in a more limited fashion after A.D. 1150.

The survey data suggest the northeast region was used relatively intensively during the late Mesilla phase. This generalization is supported further by the chronometric dates listed in Table IV-1. All seven of the chronometrically dated sites are in this section of the survey, and six of the seven date to the late Mesilla phase. These chronometrically dated sites include FB5002, which had been assigned to the aceramic period on the basis of surface material, and two sites originally assigned to the unknown ceramic period. The northeastern section, then, was used relatively heavily late in the Mesilla phase.

Sixteen sites were recorded in the southwestern section of the study area. Two of the sites are aceramic sites, one is a Mesilla phase site, two are multicomponent sites with spatially distinct Mesilla phase and El Paso phase components, and, eleven date to the El Paso phase. Mimbres ceramics were found on all three Mesilla phase components, and the three are assigned to the late Mesilla phase. Two of these components are at the end of a drainage system flowing from the Jarillas. These sites have a dense and varied ceramic assemblage and cover a combined area of 6.9 ha. The other late Mesilla component was quite small (0.06 ha). The site lacks ground stone, and its ceramic density is less than six pieces per square meter. Thirteen El Paso phase components are present. Three represent intensive occupations along the survey boundary and cover 6.7 ha; the other ten El Paso phase sites occupy a combined area of 4.79 ha. Four of these sites are categorized as intensive occupations. However, this is somewhat misleading for three of the four sites have only two ceramic types, only two have hearths, and only one has ground stone. Of the remaining six sites, four have hearths and five have ground stone.

The pattern of occupation in the southwestern section of the study area corresponds closely to land-use patterns identified by previous investigations in the region (Carmichael 1983; Whalen 1977, 1978). Several large sites are present at the base of the alluvial fans extending from the Jarilla Mountains. Small, low-density late Mesilla phase and El Paso phase sites surround these intensively used sites. This distributional pattern may provide support for the residential core/foraging zone model described in the previous chapter. This model appears to best account for the late Mesilla phase sites in the southwestern section; no substantial late Mesilla phase sites were recorded in the area surrounding the residential core. The distribution of El Paso phase sites in this area is similar to that observed in the southeastern section of the study area. These may have been logistical sites, used for the collection of wild resources.

Summary

This chapter has described the distribution of sites within the DIVAD survey area. The topics discussed included site visibility, temporal variability, occupational intensity, reuse patterns, and intersite relationships. I have argued that geomorphological processes greatly impact both site visibility and the appearance of artifact assemblages. These observations create several difficulties for the analysis of prehistoric settlement systems. As Carmichael (1983) has noted for the El Paso region, a critical first step in the analysis of prehistoric settlement patterns is identifying the influence of natural factors, such as deposition and erosion, on the archaeological record. The visibility of sites in the DIVAD survey area clearly is related to geomorphological factors.

The temporal distribution of sites in the DIVAD survey area suggests occupational intensity was highest during the El Paso phase. Land-use patterns varied across the survey area. The northeastern cluster was occupied intensively during the late Mesilla phase, and the southeastern cluster was used primarily during the El Paso phase. The Doña Ana phase, which forms a central element of Carmichael's recent study, was not identified on the present survey. Sites that would have been assigned to the Doña Ana phase using Carmichael's (1983) definition are designated multicomponent sites.

Archaeological remains in the study area were interpreted using the land-use models discussed in Chapter III. Apparently, the base of the alluvial fans extending from the Jarilla Mountains into the southwestern section of the study area was occupied intensively and was surrounded by small, low-density sites. This settlement configuration was argued to represent a residential core/foraging zone, as described in Chapter III. A pattern of large, low-density artifact scatters suggests the northwestern section of the study area may have been used extensively over a long period of time. El Paso phase sites in the southeastern sector were suggested to represent repeated, more intensive localized occupations. The settlement patterns in the northeastern section provide evidence of low-intensity occupation both prior to and after the late Mesilla phase. Data suggest the shift to more intensive land use may have occurred in the late Mesilla phase, and the use of the northeastern section apparently declined during the El Paso phase.

The spatial distribution data, coupled with information from measurements of occupational intensity (site area by phase and ceramic density and variety) suggest settlement focused on the alluvial fans. As indicated in the previous chapter, this ecological zone offers a relatively reliable water supply supporting plant as well as animal resources. It is the alluvial fans, therefore, that are likely to have been reoccupied more frequently. Concomitantly, more multicomponent sites should be near alluvial fans, and it is not surprising that all of the multicomponent sites recorded on this project are located along the fans. Interestingly, most of Carmichael's (1983) Doña Ana phase assemblages are in the same topographical setting. The frequency of apparent Doña Ana phase assemblages near the fans, then, simply may be a function of reoccupation resulting in the presence of Mimbres and Chupadero on the same site.

Scavenging also should have been more common near the fans, a function of high-intensity occupation and the large supply of used materials on the fans. Scavenging makes interpretation of the settlement patterns that produced these alluvial sites more difficult. However, without detailed observations on artifact type, quantity, and location, it is all but impossible to sort out multicomponent occupations from assemblages that actually represent the Pithouse-to-Pueblo transition in the area. When the site is used as the level of recording, and when recording is conducted at an essentially nominal scale, transitional sites will appear identical to sites that are the result of reoccupation. Detailed observations of the variability in ceramic and other artifactual remains upon a site may make multicomponency more readily identifiable. The following chapter examines a single site, FB5027, located on the Jarilla Mountain alluvial fan. Data from the site are used to document and clarify the probable effects of reoccupation and scavenging.

Chapter V

INVESTIGATING REOCCUPATION AND SCAVENGING ON FB5027

Analysis of the survey data in Chapter IV, coupled with the land-use model presented in Chapter III, suggests the spatial patterning of archaeological remains in the DIVAD survey area may be the result of a variety of processes, including deposition, erosion, reoccupation of favored locations, and scavenging and reuse of artifacts from previously occupied sites. These factors greatly complicate testing synchronic models of land use. Investigating these factors with survey data usually is hampered by the lack of quantitative data on artifact type, frequency, and location.

This chapter describes the results of the detailed investigation of a single site, FB5027. This probable residential site was selected because it is located on the edge of an alluvial fan and because its ceramic assemblage would cause it to be assigned to the Doña Ana phase. FB5027 provides an opportunity to investigate the ceramic assemblage used to recognize sites of the Doña Ana phase. As suggested in the previous chapter, the assemblage can be the result of reoccupation of favored locations. Data from the site also are used to explore the potential effects of scavenging on assemblage composition. Finally, artifactual data from the various temporal components of this large residential site shed light on aspects of the land-use models presented in the third chapter.

The following section provides an overview of the collection procedures used on FB5027. The second section describes the overall assemblages at the site. These data form the basis for the subsequent discussions of reoccupation, scavenging, and differences in adaptation reflected by the assemblages on the two components of the site.

The spatial patterning of ceramics on this site indicates the "Doña Ana" assemblage may represent the overlap of the Mesilla and El Paso phase occupations. The frequency of such site reoccupation should be related to regional occupational intensity and environmental characteristics. It is expected sites were reused most commonly in the mountain periphery zones, probably the most intensively occupied environmental zones in the area.

Patterns observed in the chipped stone data suggest the section of FB5027 associated with Mesilla phase ceramics may have served as a source of lithic raw material for later occupations. El Paso phase occupants at the site may have been scavenging previously reduced chipped stone items from this early component. Mesilla phase ground stone also may have been reused.

Finally, the last section discusses two sets of comparisons. First, Mesilla and El Paso phase ground stone artifacts are evaluated and, second, the size and weight of Mesilla and El Paso phase ceramic sherds are compared. These analyses suggest the El Paso phase component at FB5027 may have relied more heavily on agricultural products and may represent a more intensive occupation than did the earlier Mesilla component.

Methodology

Site FB5027 is a large, multicomponent site in the southwestern section of the survey area (see Figure IV-1). It is located at the base of the Jarilla Mountains. The size of the site is estimated to be 8.1 ha, but actually may be greater because a section of the site appears to be covered by the sand/sage vegetation complex. In addition, the site continues westward, outside the survey boundaries. The original survey information, summarized in Appendix A, suggested a dense Doña Ana phase ceramic assemblage on the site that included El Paso Polychrome, El Paso Brown, Chupadero, and Mimbres. This assemblage, and the location of the site in a "core area," made FB5027 ideal for investigating aspects of the Doña Ana phase and the apparent clustering of this site type in alluvial fan settings.

Given the large size of site FB5027, the limited personnel available for the investigation, and the high artifact density recorded by the initial survey, a sampling procedure was necessary. A stratified, systematic, unaligned random sampling technique was selected to ensure all areas of the site would be investigated and that representative data would be collected. Sampling locations were selected using a grid imposed on an aerial photograph; a 5-percent sample was taken.

The sampling procedure was based on a 1:1500-scale aerial photograph. After verifying the scale on the ground, a grid was imposed over the site photo. A series of 20- by 20-m blocks formed the sampling strata. Within each block, 25 4x4 meter squares were identified. From each larger block, a single 4x4 meter square was selected using a random numbers table. The selected square then was identified on the photo. Using the photograph, these squares were located on the ground, and laid out using a tape and compass. Stakes were placed at the southwest corners of all selected units for future reference. The accuracy of this method was field-checked by measuring between known squares and actual distances were found to vary by 4+ percent from estimated distances. Therefore, 30-m distances estimated from the aerial photo are in error of an average of 1.5 m. Because no detailed between-square comparisons are considered, this discrepancy is not critical for the analysis.

Two hundred and fifty-four such squares were positioned across the site, yielding information on 4,064 m^2 of the site's 8.1 ha. For each sample unit, a sketch map was prepared recording vegetation, land forms, and artifact and feature concentrations. In addition, an estimate was made of the percentage of the prehistoric surface exposed. All artifactual materials within the sample units were collected, except FCR and burned caliche (BC). These materials were counted and left in the field. The chipped stone, ground stone, and ceramics were classified by type, quantity, and size. All material, maps, field and laboratory notes, and raw data are on file at the Environmental Office on Fort Bliss. Summaries of material by square are provided in Appendix B.

General Patterning

As noted above, FB5027 is a multicomponent site with El Paso and Mesilla phase ceramics. This section summarizes the ceramic, chipped stone, and ground stone assemblages recovered from the site.

The ceramic assemblage from the site includes both Chupadero and Mimbres and conforms to Carmichael's (1983) definition of the Doña Ana phase. There are several trash middens on the site, two of which (middens 1 and 8) contain both Chupadero and Mimbres (see Figure V-1). This apparent "Doña Ana" phase ceramic assemblage, discussed below, seems to be the result of an El Paso phase occupation overlying a Mesilla phase occupation, rather than a distinct occupation occurring between A.D. 1100 and 1200. Consequently, two distinct artifact assemblages, Mesilla phase and El Paso phase, will be compared. All sampling units for which Chupadero Black-on-white, Three Rivers Red-on-terracotta, or El Paso Polychrome is the dominant ceramic type were assigned to the El Paso phase. Three such clusters are shown in Figure V-1. All other sampling units were assigned to the Mesilla phase. Aceramic squares were assigned to the closest ceramic component. While El Paso phase ceramics occasionally are present on some Mesilla phase squares, these ceramics occur in small quantities relative to El Paso Brown Ware rim sherds.

Fifty-one of the two hundred and fifty-four squares contained no data. Preliminary visits to site FB5027 suggested that on many of these squares the prehistoric surface was obscured by vegetation and by a red eolian sand associated with creosote. Visibility was particularly poor on the northern portion of the site. In addition, the southern and eastern sections of the site appear to have been obscured by a saltbush/sage/sand complex. As discussed in Chapter IV, reduced visibility of the prehistoric surface may be common throughout the region (cf. Carmichael 1983). In response to these difficulties, vegetation and sand cover were considered in estimating the contemporary visibility of the prehistoric ground surface. Visibility was estimated in the field for each collection grid. These estimates were made in five ordinal categories at 20-percent intervals. Overall visibility on FB5027 was estimated at just less than 50 percent. Thus almost half of what is thought to be the prehistoric surface may be obscured by vegetation and/or eolian soil deposition. A visibility comparison of the two components shows the average visibility of El Paso phase squares is 53 percent; 49 percent of the prehistoric surface of the Mesilla phase is visible. Because these totals are so similar, differences in visibility are not considered in the comparisons of components described in the following sections.

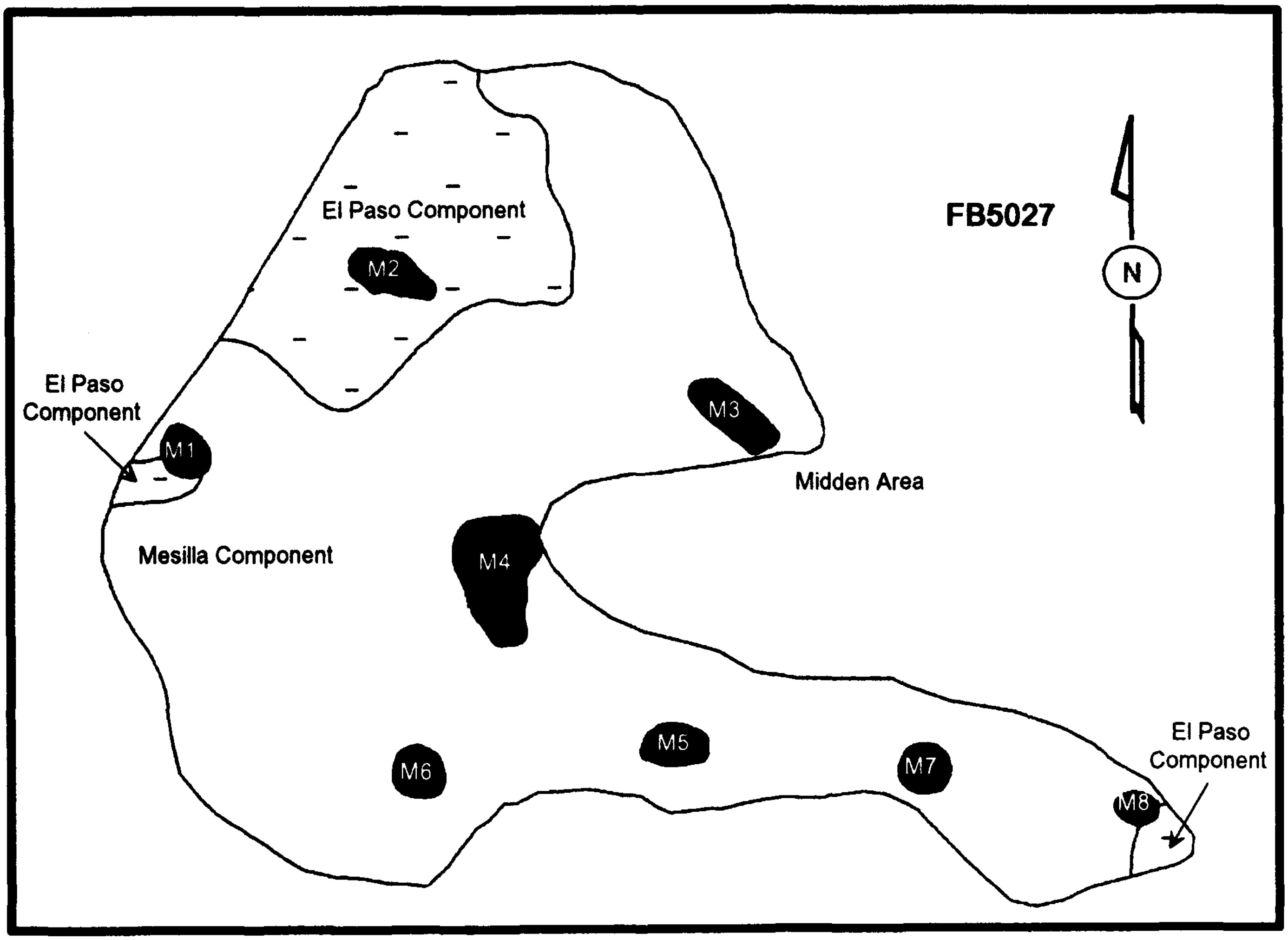

Figure V-1. FB5027 Temporal Components and Midden Locations

The Mesilla phase occupation encompasses 206 of the 254 units, or 81 percent of the sampling squares, while the El Paso phase component is present on the remaining 48 sampling units. All major artifact categories are found on both components. As noted above, no artifacts were found on 52 squares. Table V-1 presents a detailed breakdown of all major artifact classes by component. From the sample, it is estimated there are more than 250,000 artifacts on the surface of FB5027. Artifact density on the site is 3.2 per m^2; this average increases to 3.96 per m^2 if the 52 squares lacking data are excluded. Eight areas across the site are characterized by dense artifact concentrations that often contain dark, ashy soil and burned bone. These are designated midden areas and are identified by number in Figure V-1.

Prehistoric artifacts were found on 44 of the El Paso phase component squares. Average artifact density is 4.0 items per m^2 on these 44 units. The 159 Mesilla phase squares with data average 3.9 items per m^2. The difference in artifact density between the two components is not thought to be significant.

Nine thousand two hundred and eighty-seven ceramic sherds were recovered from the site. In Table V-2, ceramics are grouped by type for the two components. El Paso Polychrome, which dates to between A.D. 1100 and 1400, comprises 8 percent of the assemblage. The majority of El Paso Polychrome sherds were found on the El Paso phase component. However, El Paso Polychrome did make up 4 percent of the ceramics recovered from the Mesilla phase component. Most of the El Paso Polychrome associated with the Mesilla phase falls into West's (1982) El Paso Bichrome category, thought to have been common after A.D. 1100. However, this ceramic classification was not employed in the present analysis. El Paso Brown (A.D. 250 to 1150), made up 2 percent of the overall total; most El Paso Brown sherds were found in the Mesilla phase component. Undifferentiated brown ware was the most common ceramic type, making up 88 percent of the overall total. Several intrusive ceramic types were found on the site: Chupadero Black-on-white (1 percent), Mimbres Black-on-white (1 percent), and a few sherds of Playas Red, Three Rivers Red-on-terracotta, and Lincoln Black-on-red. With the exception of Mimbres Black-on-white, all of these intrusives were concentrated on the El Paso phase component.

Table V-1. FB5027 Major Artifact Classes by Time Period

Artifact Class	El Paso		Mesilla		Total	
	No.	Pct.	No.	Pct.	No.	Pct.
FCR	161	6	269	3	**430**	**3**
Ground Stone	17	T	41	T	**58**	**T**
Flakes	248	9	2045	20	**2293**	**18**
Shatter	110	4	595	6	**705**	**5**
Cores	10	T	39	T	**49**	**T**
L. Tools	4	T	33	T	**37**	**T**
Ceramics	2286	80	7001	70	**9287**	**72**
Miscellaneous	4	T	2	T	**6**	**T**
Total	**2840**	**99**	**10025**	**100**	**12865**	**100**

KEY: T = Trace

Three thousand five hundred and seventy-two pieces of lithic debris were recovered from FB5027. These include 2,293 flakes, 705 pieces of shatter, 86 chipped stone tools and cores, 58 pieces of ground stone, and 430 pieces of FCR and BC. Each of these categories is discussed below.

Four hundred and thirty pieces of burned rock were recovered on the site. FCR and BC made up 3 percent of the total artifact assemblage and had an overall density of .106 per m^2; FCR/BC density was 0.21 per m^2 on the El Paso phase component and 0.082 on the Mesilla phase component.

The burned rock sample is comprised primarily of limestone (81 percent) and caliche (16 percent). Other materials, mainly quartzite and granite, account for the remaining 3 percent. FCR found in the Mesilla component is 90 percent limestone; only 66 percent of the El Paso component FCR is composed of limestone.

Table V-2. FB5027 Ceramic Types by Component

Phase	El Paso Polychrome	El Paso Brown	Undifferen-tiated Brown	Chupadero Black-on-White	Mimbres Black-on-White	Other Ceramics	Total Ceramics
Mesilla	280	174	6430	1	116	0	7001
El Paso	432	10	1729	77	8	30	2286
Total	**712**	**184**	**8159**	**78**	**124**	**30**	**9287**

We know little about the prehistoric production and use of fire-cracked rock and burned caliche. Rock was employed widely as a means for heat retention and transfer by North American Indians (Driver and Massey 1957:227-249). As Pierce (1984) has made clear, different rocks have radically different heat transfer and retention properties. Different rock types may have had specialized uses. The predominance of limestone in the early period may have some implications regarding roasting activities; however, this relationship is not clear at present. Differential availability of raw material also may account for variability in the composition of the burned rock.

Fifty-eight pieces of ground stone were recovered from the site; all were fragmentary. They account for less than 1 percent of the artifacts on the site. Manos made up 40 percent (n = 23) of the ground stone assemblage, while metates accounted for 33 percent (n = 19). Miscellaneous ground stone fragments made up 26 percent (n = 15) and a single mano/metate fragment was recovered. The Mesilla and the El Paso components did not have significantly different types of ground stone.

Quartzite is the principal ground stone material (43 percent). Following in importance are sandstone (28 percent), a variety of granitic specimens (17 percent), an unknown conglomerate (7 percent), and several miscellaneous materials (4 percent). No strong relationship between ground stone and material type was identified; most material types were used to fashion the entire range of ground stone implements. Two exceptions to this generalization are the lack of metate fragments made of granitic material, and the exclusive use of the unknown conglomerate for metates.

Flakes and shatter account for 23 percent of the 12,865 items collected from the site. The densities of flakes and shatter on the Mesilla component are substantially greater than on the El Paso component. Mesilla phase flake density averages .62/m^2; El Paso phase .32/m^2. The density of shatter materials is .18/m^2 on the Mesilla component and .14/m^2 on the El Paso component. Chipped stone tool density also is greater on the Mesilla phase component (0.022 to 0.018).

Table V-3 presents types of flakes by component. Primary, secondary, and tertiary flakes were identified. On primary flakes the entire dorsal surface is covered by cortex, the dorsal surface of secondary flakes is covered partially by cortex, and tertiary flakes lack cortex. Primary flakes comprise 4 percent of the assemblage, secondary flakes 37 percent, and tertiary flakes 59 percent. These percentages do not differ substantially between the two components.

Recently, investigators at the Vista Hills site recorded a similar tertiary flake percentage (60 percent). They interpreted this ratio as evidence that later stages of lithic reduction had taken place at the site (Kauffman 1984). However, on a series of Archaic sites that were characterized by biface production and late stages of flake reduction, tertiary flakes comprised only 37 percent of all flakes (Lukowski and Mauldin 1986). Furthermore, dramatically different percentages of cortical flakes are reported by Hard (1983a) and Thompson (1979) for sites in essentially the same physical setting.

Table V-3. FB5027 Flake Types by Component

Flake Type	El Paso		Mesilla		Total	
	No.	Pct.	No.	Pct.	No.	Pct.
Primary	13	5	75	4	88	4
Secondary	93	38	761	37	854	37
Tertiary	142	57	1209	59	1351	59
Total	**248**	**100**	**2045**	**100**	**2293**	**100**

We do not know what factors condition these assemblage characteristics. The division of flakes into ordinal categories based on cortex percentage may reveal little about reduction activity. Recent experimental work on reducing chert cobbles into preforms has indicated the percentage of cortex on a flake will be of no significance after about 75 blows–less than one-half of the way through the reduction of the cobble to a preform (Tomka and Mauldin 1984). Additionally, tertiary flakes are produced throughout the reduction sequence. Therefore, a high percentage of tertiary flakes is not always indicative of the late stages of reduction. Furthermore, primary flakes are not necessarily those initially removed (Amick, Mauldin, and Tomka 1986; Stahle and Dunn 1982). These findings suggest several case-specific variables should be considered before any interpretations are based on flake typologies. These considerations include material type, fragment size and form, reduction type, and tool type (the goal of the reduction process). Until we control for some of these variables, the interpretation of reduction categories will remain ambiguous.

Six major raw material categories were distinguished in the lithic analysis. The Jarilla Mountain chert class consists of a variety of poor-quality cherts from the Jarillas, just west of FB5027. These cherts, which occasionally occur in limestone, range in color from pale green to blue. Cherts from unknown locations are of a variety of qualities and colors. Sandstones were procured from unknown sources; they range in color from a light yellow to a grayish brown. Other raw material classes include gray limestone, probably from the Jarillas, quartzites from unknown sources, and miscellaneous materials (granites, silicified limestone, chalcedony, shale).

Jarilla Mountain chert accounts for 52 percent of the collection; limestone for an additional 20 percent. If this limestone comes from the Jarillas, more than 70 percent of the material at the site is within a few hours walk. It is conceivable that almost all of the lithic material at the site came from the Jarilla Mountains.

Cores accounted for only 1 percent of the lithic assemblage at FB5027. Chert was the primary raw material selected for cores, accounting for 86 percent of all cores, 78 percent of these are Jarilla chert. Limestone (4 percent), silicified limestone (4 percent), quartzite, (2 percent) and granite (2 percent) cores also are present. Average core size is 5.3 cm; core size did not differ between components. Thirty-nine of the forty-nine cores were from the Mesilla component; and ten specimens were found on El Paso squares (all ten cores are of Jarilla chert).

Table V-4 presents a summary of tool types by component. Only four formalized tools were recovered on the El Paso component. There were 33 tools on the Mesilla phase component. Jarilla chert, quartzite, and limestone are the principal material types for hammerstones. Thirteen of the fourteen retouched tools and all utilized pieces were made of chert and other highly siliceous materials.

Table V-4. FB5027 Tool Types by Component

Phase	Hammer-stones	Facial Retouch	Marginal Retouch	Utilized Pieces	Total
Mesilla	8	3	10	12	33
El Paso	1	0	1	2	4
Total	9	3	11	14	37

This summation of artifacts for FB5027 suggests that (1) two distinct assemblages are present on the site, (2) differences in visibility are not relevant to any interassemblage comparisons, and (3) the two components have similar overall artifact densities. However, ceramics are denser on the El Paso phase component while chipped stone is more common on the Mesilla phase component. Differences between raw material types and tool types between the two occupations also were documented.

Ceramic Patterning and the Doña Ana Phase

Table V-2, which summarizes the ceramic assemblage on the site, suggests that if presence/absence data are used, portions of FB5027 resemble a Doña Ana assemblage. The site has several middens with both Chupadero and Mimbres present (see Figure V-1). However, the spatial patterning of components described above suggests the apparent Doña Ana assemblage actually may represent the overlap of the Mesilla and El Paso phase occupations. As argued in Chapter III, site reuse may be related to regional occupational intensity. FB5027 is in the mountain periphery zone, an area that should have been reoccupied frequently. The land surrounding the mountains probably was the most intensively occupied environmental zone in the area. Interestingly, this zone is the location of most Doña Ana sites (Carmichael 1983). In addition, FB5027 dates to a period when regional occupational intensity increased and site reoccupation may have been common.

The validity of Carmichael's definition of the Doña Ana phase, as well as that of Lehmer's original interpretation, hinges upon the co-occurrence of Chupadero Black-on-white with Mimbres Classic in the El Paso area. Lehmer provided the only stratigraphic evidence for such a combination in his original excavations at La Cueva (Lehmer 1948). Working in this "hideously disturbed" cave, Lehmer excavated two 1- by 1-m pits on the talus slope, employing 15-cm levels (Lehmer 1948:35-37). Lehmer noted the "top 45 centimeters of the refuse contained a mixture of El Paso Brown, El Paso Polychrome, Chupadero Black-on-white, Three Rivers Red-on-terra cotta, and Mimbres Classic" overlying a "Mesilla" assemblage. It was on the basis of these data that the ceramic assemblage of the Doña Ana phase originally was defined.

Kegley (1982) has identified a Doña Ana phase site at Hueco Tanks State Park. This site has a single radiocarbon date of A.D. 1150 ± 50 years. Based on presence/absence data, the site's ceramic assemblage of Mimbres, Chupadero, El Paso Polychrome, and El Paso Brown conforms to Lehmer's original definition of the phase. A quantitative assessment of the 33,816 sherds recovered from the site, however, reveals only 58

Mimbres sherds were found. Conversely, Chupadero is represented by 1,268 sherds, or 4 percent of the assemblage, and is 20 times more common than Mimbres. While the site technically fits the definition of the Doña Ana phase, the quantitative assessment of sherd frequencies suggests Mimbres is all but absent from the region by A.D. 1150.

Recent work by Scarborough (1984, 1986) has dated a site securely (radiocarbon and archaeomagnetism) to between A.D. 1150 and 1200. While trade wares account for only 2 percent of the more than 13,000 sherds recovered, Chupadero accounts for more than 90 percent of this intrusive category. There also are small amounts of Three Rivers Red-on-terra cotta, Playas Red, and undifferentiated Chihuahuan wares, but no Mimbres is recorded. Here we have a site, firmly dated to the Doña Ana phase's time period, that lacks the Doña Ana Phase ceramic assemblage.

It would appear from Kegley's and Scarborough's excavations that Mimbres was not present in the area shortly after 1150. This conclusion fits well with data from the Mimbres Valley; the last Mimbres sequence tree ring date is from the early 1100s (LeBlanc and Whalen 1980). Using Kegley's date, Chupadero is established firmly in the region by around 1150, and Scarborough's material suggests a similar date. This Chupadero date of 1150 agrees with the findings of Hayes, Young and Warren (1981:71-72) at Gran Quivera. While the earliest occurrence of Chupadero in the region is difficult to identify, the ceramic type does not occur on Mesilla phase sites, suggesting it did not appear until after A.D. 1100. These data effectively reduce the overlap between Chupadero and Mimbres to a span of 50 years, between A.D. 1100 and 1150. The research cited above indicates the Doña Ana phase, as defined by the co-occurrence of Chupadero and Mimbres, originally suggested to span a 100-year period between A.D. 1100 and 1200, probably lasted closer to 50 years (A.D. 1100 to 1150) and possibly a much shorter time period.

Reducing the duration of the Doña Ana occupation has a number of interpretative implications. Carmichael, as noted previously, has argued that this period represents the most intensive occupation in the region. One measure of intensity used in the previous chapter is the site area generated per phase per year. This measure provides a comparative basis for discussing changes in occupational intensity. Consequently, in order to consider potential differences in site area per year, and by implication occupational intensity, I calculated the total occupation area per phase per year for the Mesilla, Doña Ana, and El Paso phases using data from the 254 sites that inform Carmichael's survey interpretations (1983:114-119). The 51 Doña Ana phase sites have a total occupation area of 102 ha. This compares to 70 ha of site area for the preceding Mesilla phase (113 sites), and 86.5 ha for the 90 El Paso phase sites. Using the original temporal estimates of phase length, this translates to the production of .08 ha of area per year for the Mesilla phase, 1.02 ha per year for the Doña Ana phase, and .43 ha per year for the El Paso phase. Thus, even without reducing the temporal span of the Doña Ana phase, this period brought a 1,275-percent increase in site area produced per year while the site area generated per year for the El Paso phase dropped by more than 200 percent. With the shorter 50-year span for the Doña Ana phase, the area generated per year during this phase represents a 2,550-percent increase over the Mesilla phase, and is nearly six times greater than the El Paso phase.

These figures on changing occupation area per year are open to a number of interpretations, but it is unlikely the Doña Ana phase occupations in the El Paso region generated site areas at a rate 25 to 30 times greater than the preceding Mesilla phase and nearly six times greater than the subsequent El Paso phase. A more parsimonious explanation for these differences lies in the expected reoccupation patterns discussed in chapters III and IV. That is, rather than representing a transitional phase between the Pithouse and Pueblo periods, many of the sites assigned to the Doña Ana phase are the result of the frequent reoccupation of a particular physical setting, the lower alluvial fans. It is probable that these areas were occupied routinely to exploit their plentiful supply of valuable resources. Site FB5027 is located on these lower alluvial fans. Therefore, the ceramic distribution documented on FB5027 may be the product of reoccupation.

Such reoccupation has implications for interpretations of prehistoric occupational intensity in the area after A.D. 850. Carmichael's (1983) scheme, developed from his Maneuver Area 3-8 survey data, includes the Doña Ana phase as originally defined (Lehmer 1948). Carmichael maintains prehistoric occupational intensity peaked during this transitional period. Conversely, Whalen (1977, 1978), argues population increased in a linear fashion over time, reaching its apex in the El Paso phase. If the Doña Ana phase ceramic assemblage used to identify Carmichael's transitional sites represents a palimpsest, occupational intensity may not have reached its zenith between A.D. 1100 and 1200. Whalen's population growth curve also is problematic, for if El Paso phase occupations overlay Mesilla phase occupations in the lower alluvial fan areas, levels of Mesilla phase occupation will be underrepresented in Whalen's study. We cannot yet choose which of these propositions is the more correct, because we simply do not have adequate temporal control on the ceramic assemblage used to identify the phase, or an adequate understanding of factors related to reoccupation.

Three 1- by 1-m squares were placed in midden deposits on site FB5027 in hopes of obtaining adequate material for chronometric dating of Chupadero and Mimbres. Midden numbers 2, 4, and 6 on Figure V-1 were tested. Chronometric information was obtained from the northernmost (#2) and southernmost (#6) middens. Two thermoluminescence (TL) samples, each consisting of three associated sherds and soil, were submitted for analysis to Alpha Analytic.

The test results, presented in Appendix A, are problematic. The southern square, located in a Mesilla phase midden deposit, provided a weighted average date of A.D. 1470 ± 30 years. This date, drawn from three undifferentiated brown ware sherds 6 to 15 cm below the surface of the Mesilla phase occupation, is approximately 350 years later than that assigned to the Mesilla in traditional ceramic typologies. The presence of several overlying El Paso Bichrome sherds suggests a date of no earlier than A.D. 1100.

The northern TL sample consisted of a Chupadero Black-on-white sherd, an outflaring El Paso Polychrome rim sherd, and a single undifferentiated brown ware sherd. All were collected from less than 9 cm below the surface of an El Paso phase midden. This sample dated to A.D. 1580 ± 30 years. The outflaring El Paso Polychrome rim form is thought to date no earlier than A.D. 1200 (Way 1979) and no later than A.D. 1400. Chupadero, as discussed above, may fall between A.D. 1100 and 1400. Again, there is a substantial discrepancy between the TL dates and the established ceramic dates.

The use of thermoluminescence dating in the El Paso region has been plagued by such divergencies. While Whalen (1980) reports several TL dates that essentially are in agreement with the results of other chronometric techniques, other TL dates are several hundred years too recent. Scarborough (1986) recently reported similar discrepancies between TL dates and those from other chronometric sources. While archaeomagnetic, radiocarbon, and obsidian hydration techniques all date the occupation of Meyer's Pithouse Village to between A.D. 1150 and 1200, TL dates from the site suggest a date of A.D. 1515 (Scarborough 1986).

The TL dates reported by Scarborough and the TL dates presented here are consistent with each other in that both sets of dates appear to be off by about 340 years. It appears there may be a systematic error at the regional level. Correcting the TL dates from FB5027 by 340 years results in a date of A.D. 1130 for the Mesilla occupation and A.D. 1240 for the El Paso occupation. While these dates fit with the established ceramic chronology, this manipulation of chronometric data has little else to recommend it. The differences in the dates render these samples virtually useless in clarifying the nature of the Mesilla/El Paso transition. However, when used in a relative manner, the two samples do confirm the presence of two temporally distinct occupations on FB5027.

The chronometric information needed to conclusively assess the validity of a separate Doña Ana phase still is lacking. The ceramic and chronometric data presented above, Lehmer's problematic original excavation, and the likelihood that the zones in which Doña Ana phase sites are identified by presence/absence data were used heavily throughout the Ceramic period, suggest the current definition of the Doña Ana phase is of questionable utility. Doña Ana sites may be multicomponent occupations rather than representative of a transitional cultural phase between Pithouse and Pueblo periods. The phase, then, simply may be a function of the frequent reoccupation of a resource-rich environmental zone.

Lithic Patterning and Scavenging

The systematic surface collections from FB5027 also provide an opportunity to investigate the effects of scavenging on assemblage composition. The site is located in a setting that should have been reoccupied frequently, providing an opportunity for scavenging. A comparison of the two components suggests scavenging may have occurred at the site. Patterns in lithic raw material strongly suggest the Mesilla occupation served as a resource supply for the El Paso occupation. Ground stone and FCR/BC also may have been scavenged from the earlier component.

Table V-5 presents a division of raw material on FB5027 by component. While generally similar in most material categories, the Mesilla and El Paso components differ substantially in the relative frequency of Jarilla chert and limestone. Jarilla chert accounts for 66 percent of the El Paso phase assemblage while limestone makes up only 8 percent. On the other hand, Jarilla chert comprises 50 percent of the Mesilla assemblage while limestone accounts for 21 percent. The use of higher quality materials by El Paso phase peoples contrasts with patterns identified by Whalen on small sites in the central desert (1980) and by Carmichael (1983) (cf. Thompson 1979). Both *studies present* data indicating the El Paso phase was characterized by the use of "lower quality" materials.

Table V-5. FB5027 Percentage of Material by Chipped Stone Form by Component

Material Type	**Flakes**		**Shatter**		**Tools/Cores**	
	El Paso	**Mesilla**	**El Paso**	**Mesilla**	**El Paso**	**Mesilla**
J. Mtn. Chert	74	53	46	40	93	57
Other Chert	6	13	28	18	7	21
Sandstone	4	4	10	9	0	0
Limestone	6	20	13	24	0	4
Quartzite	8	5	3	4	0	4
Miscellaneous	2	5	0	5	0	14
Total	**100**	**100**	**100**	**100**	**100**	**100**

A review of other research, however, suggests the pattern observed at FB5027 is not unique. O'Laughlin (1980), in his report on the Keystone Dam sites, presents quantitative lithic data and raw material descriptions for a series of cultural periods. By collapsing his 37 raw material types into two groups, a high-quality material category (cherts, fine-grained rhyolites, fine-grained quartzite, obsidian) and a low-quality category (limestone, basalt, other coarse-grained materials), changes in material quality over time become apparent. O'Laughlin classified 57 percent of the material recovered from the Mesilla phase component as high quality. Of the El Paso phase component material, 64 percent was high quality. As at FB5027, El Paso phase people apparently used higher quality lithic materials at the Keystone Dam sites.

Interestingly, at both FB5027 and the Keystone Dam sites El Paso phase and Mesilla phase components are adjoining. The availability of reusable, high-quality Mesilla phase lithic materials may have influenced the location of El Paso phase sites. If this was the case, we may expect differences in the size and composition of the Mesilla and El Paso phase lithic assemblages at FB5027. El Paso phase raw material should represent additional reduction and may be expected to be smaller and have less remaining cortex.

A comparison of flake sizes by component suggests El Paso phase lithic material is smaller than Mesilla phase material. Forty-five percent of the El Paso material is less than 2 cm in size and only 9 percent is larger than 4 cm. Within the Mesilla phase, 37 percent is less than 2 cm and 12 percent is larger than 4 cm.

A consideration of flake size relative to material type, however, suggests different materials may be responsible for this size difference. While Jarilla chert artifacts are of similar size across the site, limestone artifacts are substantially larger on the Mesilla phase component. Size data for flakes made of Jarilla chert suggest that on each component roughly 45 percent of the flakes are smaller than 2 cm, and 7 percent are larger than 4 cm. However, limestone, a soft material generally not well suited for most cutting or scraping tasks, does vary in size between the two components. Limestone pieces on the Mesilla phase component are substantially larger: 20 percent are greater than 4 cm in size; only 11 percent of the El Paso phase limestone is in this size category.

The presence of limestone at FB5027 may have resulted from the procurement and initial reduction of Jarilla cherts. These cherts often occur in limestone. On the Mesilla occupation, a substantial percentage of the chipped stone material is limestone (21 percent), yet limestone constitutes only 8 percent of the chipped stone recovered from the El Paso component. Note also that while the number of cortical flakes in the two components' lithic assemblages does not differ significantly, no primary limestone flakes were found on the El Paso component. Primary flakes make up 4 percent of the limestone fragments found on the Mesilla occupation. This may be further evidence that Jarilla chert, already partially reduced and discarded by Mesilla phase occupants, was reused during the El Paso phase. That is, the production of primary limestone flakes may be a function of the initial reduction of Jarilla chert. The lack of such flakes on the El Paso component further suggests the collection of already decorticated cherts from the early sections of the site.

Ground stone density was .012 pieces/m^2 on the Mesilla phase component and .022 on the El Paso component. Ground stone was almost twice as common on the El Paso component. As noted above, the size of the ground stone pieces does not vary between the two components. While we would expect ground stone to be more common later in the cultural sequence as grinding activities became more important, it also may be the case that the site's El Paso phase occupants scavenged ground stone from the Mesilla phase component. Simms (1983) records this sort of ground stone reuse in the Great Basin, and there are several ethnographic accounts of the collection and reuse of manos and metates (e.g., Kelly 1964). If there were differences in the use of ground stone on the two components, scavenging would complicate their interpretation greatly.

Differences in FCR/BC totals for the two occupations also may be related to scavenging. In the absence of detailed information regarding functional differences in raw material heat retention, we may assume the availability of stone was a critical element in determining the distribution of FCR/BC. Therefore, it is potentially significant that FCR/BC fragments are much more common on the El Paso phase component. FCR/BC density is .21 pieces/m^2 on the El Paso phase component and only .082/m^2 on the Mesilla phase component. It is possible that some FCR/BC was collected from the Mesilla phase component, thereby lowering the totals for this component.

Widespread reuse of Mesilla phase artifacts by El Paso phase populations has important implications for modeling raw material procurement, chipped stone and ground stone assemblage composition, and interpretations of FCR/BC totals for the two periods. For example, Mesilla phase groups may have traveled to the Jarilla Mountains and brought large pieces of higher quality materials to the site. Conversely, during the El Paso occupation at FB5027, raw materials may have been procured in a partially reduced state, not from the Jarilla Mountains, but from the Mesilla component less than 100 m away. Evidence for scavenging is difficult to identify; scavenging is recognized only with well-controlled spatial data.

Intercomponent Differences and Adaptive Models

Finally, the data recovered from the site provides an opportunity to investigate dependence on agriculture, an aspect of adaptation relevant to both the synchronic and diachronic models of land use discussed in Chapter III. Both Hard (1983b) and Mauldin (1984), following a number of earlier researchers (e.g., Whalen 1977, 1978; Bradley 1983; Carmichael 1983) have argued that agriculture probably was more important late in the prehistoric cultural sequence. They suggest this increased reliance on agriculture should be evidenced by changes in ceramic and ground stone assemblages. The FB5027 data provide an opportunity to investigate these suggestions.

Goldborer (1985), in a cross-cultural analysis of ethnographic groups, found a strong positive relationship between increasing dependence upon agriculture and the prevalence of ceramics. While Goldborer does not explore the reasons underlying this relationship, other work (e.g., Hard 1983b; Stiger 1980) suggests that the need to reduce starch, the major caloric element in corn, to an easily digestible form may be involved. Moisture and heat, specifically soaking and boiling, are required to convert starch to digestible sugars. Ceramic containers are efficient for application of both heat and moisture. While prehistoric groups probably had a variety of soaking and boiling methods, the most efficient of these methods may well have involved ceramics. Grain storage, which also should increase with greater reliance on agriculture, also may have encouraged the use of ceramics.

Several researchers (Bartlett 1933; Martin and Rinaldo 1947; Martin and Plog 1974; Lancaster 1983) have suggested larger ground stone may signal increased dependence on corn. Hard (1983b, 1986) has conducted cross-cultural analyses of the relationship between agricultural dependence and mano size and found a significant correlation between the two. He suggests, following Lancaster (1983), this relationship is an outgrowth of increased efficiency supplied by the larger ground stone. As dependence on corn increased, a substantial amount of time was devoted to grinding. When this investment in labor began to conflict with other activities, there was pressure to adopt less time-consuming practices. One way to reduce the time required to grind corn may have been to increase the grinding area of the ground stone tools. Therefore, adaptations that were highly dependent upon agriculture should be represented by large ground stone tools.

This foregoing discussion of agricultural dependence and its relationships with ceramic and ground stone use leads to the expectation that ceramics became more prevalent and ground stone tools larger as the Mesilla phase gave way to the more agriculturally oriented El Paso phase. While the ground stone data from the two components on FB5027 are ambiguous, there are differences between the El Paso phase and Mesilla phase ceramic material. The El Paso phase component contained 25 percent of all ceramic material; the average ceramic density was 2.97 ceramics/m^2. Ceramic density on the Mesilla phase component was 2.12/m^2. The El Paso phase component, then, contained 1.4 times more ceramics/m^2 than the Mesilla phase occupation at FB5027.

This difference might indicate a higher level of occupational intensity during the El Paso phase. The greater ceramic density on the El Paso phase component, however, also may be related to differences in vessel size. During the El Paso phase, large ceramic ollas and other large jar forms are thought to have been common. There are 41 body sherds for every rim sherd recovered on the El Paso component of FB5027. The ratio for the Mesilla occupation is only 27 to 1. Assuming sherd size does not differ significantly between the phases, this difference suggests larger vessels were made during the El Paso phase.

Tables V-6 and V-7 present El Paso and Mesilla component ceramic types by size class. The data suggest El Paso phase sherds are substantially smaller than Mesilla sherds. Fifty-seven percent of the El Paso phase ceramics measure less than 2 cm in length compared with only 47 percent of the Mesilla phase ceramic assemblage. Differences in the rim-to-body ratios, then, may be the product of the El Paso phase sherds' smaller size.

In order to correct for these size differences, the weights of the ceramic assemblages were estimated. Ceramics in each size class were assigned a constant weight based on the average weight of a sample of sherds from that size class. A sample of 224 sherds between 0 and 2 cm long produced an average weight of 1.2 grams. Ceramics in the 2- to 4-cm range averaged 4.0 grams (n = 236). Sherds from 4 to 6 cm in length averaged 11.7 grams (n = 46), and those in the 6- to 8-cm range averaged 25.7 grams (n = 8). For each size category, the number of sherds was multiplied by these average weights, yielding an overall ceramic weight for the component. These totals then were used to calculate the relative frequency of rim-to-body sherds. While this correction reduced the difference between the two components, the Mesilla phase ceramics continued to have a smaller rim-to-weight ratio. The Mesilla phase component averaged 86.4 grams of ceramic material per rim while the El Paso phase ceramics averaged 118.9 grams per rim. The El Paso phase ceramic assemblage appears to be represented by larger vessels.

Table V-6. FB5027 El Paso Component Ceramic Types by Size

Type	0-2 cm	2-4 cm	4-6 cm	6-8 cm	Total
El Paso Polychrome	213	198	21	0	**432**
El Paso Brown	6	3	1	0	**10**
Undifferentiated Brown Ware	1045	604	64	16	**1729**
Chupadero B/W	34	36	7	0	**77**
Mimbres B/W	2	3	3	0	**8**
Other	12	16	1	1	**30**
Total No.	**1312**	**860**	**97**	**17**	**2286**
Total Pct.	**57**	**38**	**4**	**1**	**100**

The increased importance of ceramics in the El Paso phase, suggested by their greater overall density on FB5027, and the manufacture of larger vessels during that period, suggested by the rim-to-weight ratio, is consistent with the land-use models summarized in Chapter III and suggests greater dependence on corn during this period.

However, the ground stone data show no substantial differences in size. The ground stone items, as noted above, are fragmentary, making it difficult to gauge the size of the various specimens. El Paso phase component mano fragments were slightly larger (El Paso mean size = 7.2 cm, Mesilla = 7.0 cm), while average metate fragment size is identical for the two periods. Miscellaneous fragments on the Mesilla component are somewhat larger than those found on the El Paso component (Mesilla = 6.8, El Paso = 4.9).

This pattern does not support the suggestion that grinding stones were larger during the El Paso period. However, the fragmentary nature of the assemblage makes any interpretation problematic, and scavenging may have altered the assemblages and further obscured direct interpretation.

Data from the ground stone assemblages on the site neither confirm nor invalidate the predictions regarding increased dependence on corn and resulting larger sizes of ground stone. Conversely, the ceramic data do support the suggestion that the El Paso occupations at the site were more dependent on agriculture.

Summary

Three principal implications of the above analysis merit emphasis. These involve both temporal and functional considerations. First, when presence/absence data are used, portions of FB5027 resemble a Doña Ana assemblage, complete with middens. However, the spatial patterning of components suggests the apparent Doña Ana assemblage instead may represent the overlap of the Mesilla and El Paso phase occupations. The frequency of such site reuse should be related to regional occupational intensity. It is expected that sites were reused most commonly in the mountain periphery zones, probably the most intensively occupied environmental zone in the area. Interestingly, most Doña Ana sites are located in this zone (Carmichael 1983).

Table V-7. FB5027 Mesilla Component Ceramic Types by Size

Type	0-2 cm	2-4 cm	4-6 cm	6-8 cm	Total
El Paso Polychrome	108	138	32	3	281
El Paso Brown	41	116	15	2	174
Undifferentiated Brown Ware	3151	2939	311	29	6430
Chupadero B/W	0	0	1	0	1
Mimbres B/W	26	75	14	1	116
Other	4	5	1	0	10
Total No.	**3330**	**3273**	**374**	**35**	**7012**
Total Pct.	**47**	**47**	**5**	**1**	**100**

Second, the distribution of chipped stone, FCR/BC, and ground stone also indicates the site may have been reoccupied. Patterns observed in the chipped stone data seem to have been related to access to raw materials. The Mesilla phase inhabitants of FB5027 may have collected most of their lithic materials from the Jarilla Mountains. The El Paso phase occupants, on the other hand, probably relied on previously used Mesilla component materials. Similar processes may have generated the ground stone and FCR/BC assemblages as well.

Third, ceramic and ground stone data suggest agriculture was more important during the El Paso phase than it had been during the Mesilla phase. These two artifact types make up a larger proportion of the total El Paso phase assemblage than they do of the Mesilla phase assemblage. As indicated by the rim sherd-to-body sherd index, the larger vessels are associated with the El Paso phase. Larger vessels may have facilitated corn preparation and storage. Future research might investigate the particular vessel types (i.e., cooking jars, storage jars, serving bowls) that make up each assemblage (Braun 1983). This information could be derived by investigating rim form, orifice diameter, presence of soot, and technological variables (cf. Nelson 1985).

Ground stone fragments are more prevalent on the El Paso component, but there is no significant difference in size between the two components. Because ground stone remains are fragmentary, these findings are difficult to interpret. Ground stone reuse and curation may obscure prehistoric ground stone use patterns. Taken in conjunction with the ceramic data, however, the greater density of ground stone fragments on the El Paso phase component may support the suggestion that El Paso phase groups were more reliant on farming.

Chapter VI

SUMMARY

The previous chapters discussed several aspects of the DIVAD archaeological project conducted by the Fort Bliss Environmental Management Office. The project was initiated in response to a proposal to construct and use airstrip facilities on McGregor Guided Missile Range on Fort Bliss. The project was designed to mitigate the effect of the construction upon prehistoric cultural remains. Archaeological work was conducted in accordance with the Fort Bliss Historic Preservation Plan (1982), a document developed to guide management of the historic resources on the post. The goal of the project was to contribute to an understanding of the archaeological record on Fort Bliss in order to provide a more effective management strategy. Fieldwork consisted of a survey of approximately 35 km^2 in which 69 archaeological sites were recorded. This chapter will summarize the project's most important findings and provide suggestions for additional research.

Project Summary

In Chapter II, it was argued that the lower alluvial fans associated with mountains should have been reused frequently during much of the prehistoric sequence because of increased water availability and higher soil moisture. This suggestion, explored in Chapter III, has implications for teseting synchronic land-use models. These models are descriptions of how prehistoric cultural systems may have functioned at a given point in time. The archaeological record is the result of long-term processes that may obscure the artifact assemblages required to test these synchronic models. The reoccupation of the same location for different activities, and the subsequent scavenging of artifacts from earlier sites by later groups, complicate any direct test of these synchronic models.

Chapter III presented an initial attempt to develop expectations for site locations and their artifact content that may have been generated by a series of behavioral and organizational systems. It was suggested that aspects of settlement patterns and artifact assemblages vary across a series of distinct environmental zones. Portions of the study area that offered a more reliable water supply are expected to have been reused more frequently. These areas include the lower alluvial fans and large playas associated with the fans.

The possibility that the lower alluvial slopes were reoccupied frequently during most of the cultural history of the region complicates the interpretation of archaeological remains in this area. The roles sites played in the subsistence and settlement systems operating in the past, and the temporal placement of sites, become difficult to identify.

Chapter IV documented the potential for natural processes to obscure evidence of prehistoric human activity. The lack of sites in the central part of the DIVAD survey is attributed to the presence of large, shifting sand ridges that all but obscure the prehistoric surface. Until we can account for the geomorphological processes that affect the archaeological record, interpretations of prehistoric settlement patterns will be suspect. Chapter IV also discusses the distribution of the temporal components in the DIVAD survey area. This discussion focuses on long-term patterns of land use as well as synchronic elements.

Chapter V presents the detailed investigation of site FB5027. The site is located at the base of an alluvial fan and it provides evidence of the effects of reoccupation and scavenging. An analysis of the ceramics found on FB5027 suggests that its "Doña Ana" assemblage is the result of reoccupation and not representative of a distinct temporal phase. Several recent studies have produced new estimated dates for the Doña Ana phase: It is estimated the phase lasted from A.D. 1100 until A.D. 1150, not until A.D. 1200 as previously suggested. The lithic assemblage at FB5027 provides evidence that scavenging often occurred when sites were reoccupied. Finally, analysis of the ceramic assemblages from the Mesilla and El Paso phase components of FB5027 supports the suggestion, made by previous researchers, that the El Paso phase increasingly was dependent on agriculture.

Implications and Future Research

Most research in the study area has concentrated on developing synchronic land-use models (e.g., Carmichael 1983; Fields and Girard 1983; O'Laughlin 1980). While this work is important and must continue, the models developed may not be directly testable given the complicating factors of reoccupation and scavenging outlined here.

Synchronic models for the Fort Bliss area (e.g., Hard 1983b; Mauldin 1984) have been constructed in the context of Hard's 1980 model of diachronic change. Hard's model stresses regional population growth and its implications for cultural change (cf. Binford 1983a; Carniero 1970). It may be possible to evaluate many of Hard's propositions, particularly his statements regarding changes in hunting, agriculture, and mobility, with the methodologies being developed (Hard 1983b; Hard and Mauldin 1986).

Many of the nascent methodologies now available may be more applicable to diachronic rather than synchronic questions. Changes in ground stone, ceramic, and lithic use over time may relate to general changes in cultural systems. However, not all assemblages are equally reflective of organizational-level change. For example, logistical camps established for deer hunting should be similar in appearance from the Late Archaic through the Pueblo period, even though the importance of deer as a subsistence resource may have decreased significantly between these two periods. Similarly, the ground stone assemblage at a winter Mesilla phase village may closely resemble that found on an El Paso phase summer camp because similar amounts of corn were processed at the two types of sites. These considerations, together with the ambiguities generated by site reuse, demonstrate that sites used to test either synchronic or diachronic models must be selected and compared with caution.

The questions concerning the Doña Ana phase discussed in chapters IV and V attest to the potentially complicating effects of reoccupation. As currently defined, this phase may have little utility as an interpretative construct. Defined by the co-occurrence of Mimbres and Chupadero, the Doña Ana assemblage cannot be distinguished from ceramic assemblages produced by reoccupation. This is not to argue that the Doña Ana phase does not exist. Rather, the recognition of this phase with presence/absence data collected at the site level is problematic. Data from FB5027 indicate that if provenience is controlled on an intrasite basis, some cases of multicomponency can be identified.

Appendix A

SITE SURVEY DATA

For each of the 69 sites recorded for the DIVAD project area, the following 11 data categories are presented: site number (e.g. FB5000), temporal designation, site area, estimated hearth number, maximum ceramic density per square meter (LT = less than), major ceramic types present, ground stone presence/absence, chipped stone presence/absence, general site location within the survey area, site mitigation activities, and chronometric dates and locations.

Site No.: FB5000

Cultural Period/Phase: Jornada Mogollon, Mesilla phase, A.D. 250-1100
Site Area: 4.5 ha
Hearths: 6-10
Maximum Ceramic Density: 50 + per m^2
Major Ceramic Types: El Paso Bichrome, El Paso Polychrome, El Paso Brown, Mimbres Classic Black-on-white, Three Rivers Red-on-terra cotta, Playas Red
Ground Stone: present
Chipped Stone: present
Site Location within Survey Area: northeastern section
Mitigation Activities: test excavation and surface collection
Dates: Dates of A.D. 1200 ± 30 and 1192 ± 12 were obtained from surface obsidian. The obsidian dates correspond with hydration rim values of 2.61u ± 0.05u and 2.63u ± 0.02u respectively. A radiocarbon date of A.D. 990 ± 100 was obtained from a hearth 108 cm below datum. (Beta # 13202)

Site No.: FB5001

Cultural Period/Phase: Jornada Mogollon, inseparable Mesilla phase and El Paso phase components present, A.D. 250-1400
Site Area: 2.36 ha
Hearths: 5
Maximum Ceramic Density: less than 6 per m^2
Major Ceramic Types: El Paso Brown, El Paso Bichrome, El Paso Polychrome, Mimbres Black-on-white, Chupadero Black-on-white
Ground Stone: present
Chipped Stone: present
Site Location within Survey Area: northeastern section
Mitigation Activities: surface collection
Dates: none

Site No.: FB5002

Cultural Period/Phase: unknown
Site Area: .01 ha
Hearths: 2
Maximum Ceramic Density: no ceramics present

Site No.: FB5002, continued

Major Ceramic Types: none
Ground Stone: present
Chipped Stone: present
Site Location within Survey Area: northeastern section
Mitigation Activities: surface collection and extensive excavation
Dates: A radiocarbon date of A.D. 850 ± 70 was obtained from level 3 of feature 5, a hearth. (Beta # 13199)

Site No.: FB5003

Cultural Period/Phase: Jornada Mogollon, Mesilla phase, A.D. 250-1100
Site Area: .01 ha
Hearths: 1
Maximum Ceramic Density: less than 6 per m^2
Major Ceramic Types: El Paso Brown, El Paso Bichrome
Ground Stone: present
Chipped Stone: present
Site Location within Survey Area: northeastern section
Mitigation Activities: surface collection
Dates: none

Site No.: FB5004

Cultural Period/Phase: Jornada Mogollon, inseparable Mesilla phase and El Paso components present, A.D. 250-1400
Site Area: 2.04 ha
Hearths: 12
Maximum Ceramic Density: 6-20 per m^2
Major Ceramic Types: El Paso Polychrome, El Paso Brown, Chupadero Black-on-white, Galisteo Black-on-white, Mimbres Black-on-white
Ground Stone: present
Chipped Stone: present
Site Location within Survey Area: northeastern section
Mitigation Activities: surface collection
Dates: none

Site No.: FB5005

Cultural Period/Phase: Jornada Mogollon, Formative period, A.D. 250-1400
Site Area: .64 ha
Hearths: 3-5
Maximum Ceramic Density: less than 6 per m^2
Major Ceramic Types: Undifferentiated brownware
Ground Stone: present
Chipped Stone: present
Site Location within Survey Area: northeastern section
Mitigation Activities: surface collection
Dates: none

Site No.: FB5007

Cultural Period/Phase: Jornada Mogollon, Formative period, A.D. 250-1400
Site Area: .72 ha
Hearths: 3
Maximum Ceramic Density: less than 6 per m^2
Major Ceramic Types: Undifferentiated brownware
Ground Stone: present
Chipped Stone: present
Site Location within Survey Area: northeastern section
Mitigation Activities: surface collection
Dates: Surface obsidian produced a date of A.D. 894 ± 53 years. A hydration rim value of 2.00u ± 0.05u was obtained.

Site No.: FB5008

Cultural Period/Phase: Jornada Mogollon, Formative period, A.D. 250-1400
Site Area: .20 ha
Hearths: 5
Maximum Ceramic Density: less than 6 per m^2
Major Ceramic Types: Undifferentiated brownware
Ground Stone: present
Chipped Stone: present
Site Location within Survey Area: northeastern section
Mitigation Activities: surface collection
Dates: none

Site No.: FB5009

Cultural Period/Phase: unknown
Site Area: .11 ha
Hearths: 1
Maximum Ceramic Density: no ceramics present
Major Ceramic Types: none
Ground Stone: present
Chipped Stone: present
Site Location within Survey Area: northeastern section
Mitigation Activities: surface collection
Dates: none

Site No.: FB5010

Cultural Period/Phase: Jornada Mogollon, Formative period, A.D. 250-1400
Site Area: .60 ha
Hearths: 5-10
Maximum Ceramic Density: less than 6 per m^2
Major Ceramic Types: Undifferentiated brownware
Ground Stone: present
Chipped Stone: present

Site No.: FB5010, continued

Site Location within Survey Area: northeastern section
Mitigation Activities: surface collection
Dates: Surface obsidian produced a date of A.D. 856 ± 49 years. A hydration rim value of 3.14u ± 0.07u was obtained.

Site No.: FB5011

Cultural Period/Phase: Jornada Mogollon, El Paso phase, A.D. 1200-1400
Site Area: .76 ha
Hearths: 8-10
Maximum Ceramic Density: less than 6 per m^2
Major Ceramic Types: El Paso Polychrome, Chupadero Black-on-white
Ground Stone: present
Chipped Stone: present
Site Location within Survey Area: northeastern section
Mitigation Activities: surface collection
Dates: none

Site No.: FB5012

Cultural Period/Phase: Jornada Mogollon, Mesilla phase, A.D. 250-1100
Site Area: .20 ha
Hearths: 6
Maximum Ceramic Density: 6-20 per m^2
Major Ceramic Types: El Paso Bichrome, El Paso Brown, Mimbres Black-on-white
Ground Stone: present
Chipped Stone: present
Site Location within Survey Area: northeastern section
Mitigation Activities: surface collection and excavation
Dates: A radiocarbon date of A.D. 840 ± 50 was obtained from square 10 west 6 north at 30 cm below datum. (Beta # 13201)

Site No.: FB5013

Cultural Period/Phase: Jornada Mogollon, Formative Period, A.D. 250-1400
Site Area: .72 ha
Hearths: 1-5
Maximum Ceramic Density: less than 6 per m^2
Major Ceramic Types: Undifferentiated brownware
Ground Stone: present
Chipped Stone: present
Site Location within Survey Area: northeastern section
Mitigation Activities: surface collection
Dates: none

Site No.: FB5015

Cultural Period/Phase: Jornada Mogollon, Mesilla phase, A.D. 250-1100
Site Area: .34 ha
Hearths: 3-5
Maximum Ceramic Density: less than 6 per m^2
Major Ceramic Types: El Paso Brown
Ground Stone: present
Chipped Stone: present
Site Location within Survey Area: northeastern section
Mitigation Activities: surface collection
Dates: none

Site No.: FB5016

Cultural Period/Phase: Jornada Mogollon, Mesilla phase, A.D. 250-1100
Site Area: 1.72 ha
Hearths: 10
Maximum Ceramic Density: less than 6 per m^2
Major Ceramic Types: El Paso Brown
Ground Stone: present
Chipped Stone: present
Site Location within Survey Area: northeastern section
Mitigation Activities: test excavation and surface collection
Dates: A radiocarbon date of A.D. 110 ± 60 years was obtained from feature 3, level 3. (Beta # 13200)

Site No.: FB5017

Cultural Period/Phase: Jornada Mogollon, Mesilla phase, A.D. 250-1100
Site Area: 1.16 ha
Hearths: 5-7
Maximum Ceramic Density: less than 6 per m^2
Major Ceramic Types: El Paso Brown
Ground Stone: present
Chipped Stone: present
Site Location within Survey Area: northeastern section
Mitigation Activities: surface collection
Dates: none

Site No.: FB5018

Cultural Period/Phase: unknown
Site Area: .07 ha
Hearths: 2
Maximum Ceramic Density: no ceramics present
Major Ceramic Types: none
Ground Stone: present
Chipped Stone: present
Site Location within Survey Area: northeastern section

Site No.: FB5018, continued

Mitigation Activities: surface collection
Dates: none

Site No.: FB5019

Cultural Period/Phase: Jornada Mogollon, Mesilla phase, A.D. 250-1100
Site Area: .33 ha
Hearths: 3
Maximum Ceramic Density: less than 6 per. m^2
Major Ceramic Types: El Paso Brown
Ground Stone: present
Chipped Stone: present
Site Location within Survey Area: northeastern section
Mitigation Activities: surface collection
Dates: Surface obsidian produced a date of A.D. 887 ± 81 years. A hydration rim value of 2.01u ± 0.07u was obtained.

Site No.: FB5020

Cultural Period/Phase: unknown
Site Area: .32 ha
Hearths: 4-5
Maximum Ceramic Density: no ceramics present
Major Ceramic Types: none
Ground Stone: present
Chipped Stone: present
Site Location within Survey Area: northeastern section
Mitigation Activities: surface collection
Dates: none

Site No.: FB5021

Cultural Period/Phase: Jornada Mogollon, Mesilla phase, A.D. 250-1100
Site Area: .20 ha
Hearths: 0
Maximum Ceramic Density: less than 6 per m^2
Major Ceramic Types: Undifferentiated brownware, Mimbres Black-on-white
Ground Stone: present
Chipped Stone: present
Site Location within Survey Area: northeastern section
Mitigation Activities: total surface collection
Dates: none

Site No.: FB5022

Cultural Period/Phase: Jornada Mogollon, El Paso phase, A.D. 1200-1400
Site Area: .48 ha

Site No.: FB5022, continued

Hearths: 5
Maximum Ceramic Density: 21-50 per m^2
Major Ceramic Types: El Paso Polychrome, El Paso Bichrome, Chupadero Black-on-white, El Paso Brown, San Andres Red-on-terra cotta
Ground Stone: present
Chipped Stone: present
Site Location within Survey Area: northeastern section
Mitigation Activities: surface collection
Dates: none

Site No.: FB5024

Cultural Period/Phase: unknown
Site Area: .06 ha
Hearths: 1
Maximum Ceramic Density: no ceramics present
Major Ceramic Types: none
Ground Stone: present
Chipped Stone: present
Site Location within Survey Area: northeastern section
Mitigation Activities: surface collection
Dates: none

Site No.: FB5025

Cultural Period/Phase: Jornada Mogollon, El Paso phase, A.D. 1200-1400
Site Area: 4.20 ha
Hearths: 6-10
Maximum Ceramic Density: 21-50 per m^2
Major Ceramic Types: El Paso Polychrome, El Paso Bichrome, Chupadero Black-on-white, El Paso Brown, Playas Red, Three Rivers Red-on-terra cotta
Ground Stone: present
Chipped Stone: present
Site Location within Survey Area: southwestern section
Mitigation Activities: none
Dates: Surface obsidian was submitted for dating. A hydration rim value of 2.78u ± 0.08u was obtained. No calendar date was obtained.

Site No.: FB5026

Cultural Period/Phase: Jornada Mogollon, El Paso phase, A.D. 1200-1400
Site Area: 1.76 ha
Hearths: 2-5
Maximum Ceramic Density: 21-50 per m^2
Major Ceramic Types: El Paso Polychrome, El Paso Bichrome, Chupadero Black-on-white, Three Rivers Red-on-terra cotta, San Andres Red-on-terra cotta
Ground Stone: present

Site No.: FB5026, continued

Chipped Stone: present
Site Location within Survey Area: southeastern section
Mitigation Activities: none
Dates: none

Site No.: FB5027

Cultural Period/Phase: Jornada Mogollon, Mesilla phase, A.D. 250-1150, El Paso phase, A.D. 1200-1400
Site Area: 8.1 ha
Hearths: 8-10
Maximum Ceramic Density: 21-50 per m^2
Major Ceramic Types: El Paso Polychrome, El Paso Brown, Mimbres Black-on-white, Chupadero Black-on-white, El Paso Bichrome
Ground Stone: present
Chipped Stone: present
Site Location within Survey Area: southwestern section
Mitigation Activities: test excavation and surface collection
Dates: Two samples, each consisting of three ceramic sherds, were submitted to Alpha Analytic of Coral Gables, Florida, for thermoluminescence dating. The first sample, numbers Alpha-2101, Alpha-2102, and Alpha 2103, produced a weighted mean date of 370 years B.P. ± 30 years. The second sample, numbers Alpha-2104, Alpha -2105, and Alpha-2106, produced a weighted mean date of 480 years B.P. ± 30 years.

Site No.: FB5028

Cultural Period/Phase: Jornada Mogollon, Mesilla phase, A.D. 250-1100
Site Area: 10.0 ha
Hearths: 15-20
Maximum Ceramic Density: less than 6 per m^2
Major Ceramic Types: El Paso Brown
Ground Stone: present
Chipped Stone: present
Site Location within Survey Area: northwestern section
Mitigation Activities: none
Dates: none

Site No.: FB5029

Cultural Period/Phase: Jornada Mogollon, El Paso phase, A.D. 1200-1400
Site Area: .60 ha
Hearths: 4
Maximum Ceramic Density: less than 6 per m^2
Major Ceramic Types: El Paso Polychrome, Mimbres, Chupadero, one unknown ceramic type
Ground Stone: present
Chipped Stone: present
Site Location within Survey Area: northeastern section
Mitigation Activities: none
Dates: none

Site No.: FB5031

Cultural Period/Phase: Jornada Mogollon, El Paso phase, A.D. 1200-1400
Site Area: .12 ha
Hearths: 1-5
Maximum Ceramic Density: 6-20 per m^2
Major Ceramic Types: El Paso Polychrome, Chupadero Black-on-white, El Paso Brown, Three Rivers Red-on-terra cotta, Playas Red
Ground Stone: present
Chipped Stone: present
Site Location within Survey Area: southeastern section
Mitigation Activities: none
Dates: none

Site No.: FB5032

Cultural Period/Phase: Jornada Mogollon, inseparable Mesilla phase and El Paso phase components present, A.D. 250-1400
Site Area: .09 ha
Hearths: 2
Maximum Ceramic Density: less than 6 per m^2
Major Ceramic Types: El Paso Polychrome, El Paso Bichrome, El Paso Brown, Mimbres Black-on-white
Ground Stone: present
Chipped Stone: present
Site Location within Survey Area: southeastern section
Mitigation Activities: none
Dates: none

Site No.: FB5033

Cultural Period/Phase: Jornada Mogollon, El Paso phase, A.D. 1200-1400
Site Area: .09 ha
Hearths: 0
Maximum Ceramic Density: less than 6 per m^2
Major Ceramic Types: El Paso Polychrome
Ground Stone: none
Chipped Stone: present
Site Location within Survey Area: southwestern section
Mitigation Activities: none
Dates: none

Site No.: FB5034

Cultural Period/Phase: Jornada Mogollon, El Paso phase, A.D. 1200-1400
Site Area: .01 ha
Hearths: 0
Maximum Ceramic Density: 21-50 per m^2
Major Ceramic Types: El Paso Polychrome, Three Rivers Red-on-terra cotta
Ground Stone: none

Site No.: FB5034, continued

Chipped Stone: present
Site Location within Survey Area: southwestern section
Mitigation Activities: none
Dates: none

Site No.: FB5035

Cultural Period/Phase: Jornada Mogollon, El Paso phase, A.D. 1200-1400
Site Area: .04 ha
Hearths: 2
Maximum Ceramic Density: less than 6 per m^2
Major Ceramic Types: Undifferentiated brownware, possibly Galisteo Black-on-white
Ground Stone: present
Chipped Stone: present
Site Location within Survey Area: southwestern section
Mitigation Activities: none
Dates: none

Site No.: FB5037

Cultural Period/Phase: Jornada Mogollon, El Paso phase, A.D. 1200-1400
Site Area: .28 ha
Hearths: 2
Maximum Ceramic Density: less than 6 per m^2
Major Ceramic Types: El Paso Polychrome, Chupadero Black-on-white
Ground Stone: none
Chipped Stone: present
Site Location within Survey Area: southwestern section
Mitigation Activities: none
Dates: none

Site No.: FB5038

Cultural Period/Phase: Jornada Mogollon, El Paso phase, A.D. 1200-1400
Site Area: .11 ha
Hearths: 0
Maximum Ceramic Density: 6-20 per m^2
Major Ceramic Types: Undifferentiated brownware, Chupadero Black-on-white
Ground Stone: none
Chipped Stone: present
Site Location within Survey Area: southwestern section
Mitigation Activities: none
Dates: none

Site No.: FB5039

Cultural Period/Phase: Jornada Mogollon, El Paso phase, A.D. 1200-1400
Site Area: .38 ha

Site No.: FB5039, continued

Hearths: 5
Maximum Ceramic Density: less than 6 per m^2
Major Ceramic Types: El Paso Polychrome, Chupadero Black-on-white
Ground Stone: present
Chipped Stone: present
Site Location within Survey Area: southwestern section
Mitigation Activities: none
Dates: none

Site No.: FB5041

Cultural Period/Phase: Jornada Mogollon, Mesilla phase, A.D. 250-1100
Site Area: .06 ha
Hearths: 0
Maximum Ceramic Density: less than 6 per m^2
Major Ceramic Types: El Paso Brown, Mimbres Black-on-white, El Paso Polychrome
Ground Stone: none
Chipped Stone: none
Site Location within Survey Area: southwestern section
Mitigation Activities: none
Dates: none

Site No.: FB5042

Cultural Period/Phase: Jornada Mogollon, El Paso phase, A.D. 1200-1400
Site Area: .84 ha
Hearths: 1-5
Maximum Ceramic Density: 21-50 per m^2
Major Ceramic Types: El Paso Polychrome, Chupadero Black-on-white, Playas Red, Three Rivers Red-on-terra cotta
Ground Stone: present
Chipped Stone: present
Site Location within Survey Area: southeastern section
Mitigation Activities: none
Dates: none

Site No.: FB5043

Cultural Period/Phase: Jornada Mogollon, El Paso phase, A.D. 1200-1400
Site Area: .04 ha
Hearths: 0
Maximum Ceramic Density: 6-20 per m^2
Major Ceramic Types: El Paso Polychrome, Chupadero Black-on-white
Ground Stone: present
Chipped Stone: present
Site Location within Survey Area: southeastern section
Mitigation Activities: none
Dates: none

Site No.: FB5044

Cultural Period/Phase: Jornada Mogollon, El Paso phase, A.D. 1200-1400
Site Area: .12 ha
Hearths: 1
Maximum Ceramic Density: 21-50 per m^2
Major Ceramic Types: El Paso Polychrome, Chupadero Black-on-white, Three Rivers Red-on-terra cotta
Ground Stone: none
Chipped Stone: present
Site Location within Survey Area: southeastern section
Mitigation Activities: none
Dates: none

Site No.: FB5046

Cultural Period/Phase: Jornada Mogollon, El Paso phase, A.D. 1200-1400
Site Area: .12 ha
Hearths: 4
Maximum Ceramic Density: 6-20 per m^2
Major Ceramic Types: El Paso Polychrome, Chupadero Black-on-white, Three Rivers Red-on-terra cotta, El Paso Brown
Ground Stone: present
Chipped Stone: present
Site Location within Survey Area: southeastern section
Mitigation Activities: none
Dates: none

Site No.: FB5047

Cultural Period/Phase: Jornada Mogollon, El Paso phase, A.D. 1200-1400
Site Area: 3.72 ha
Hearths: 2
Maximum Ceramic Density: less than 6 per m^2
Major Ceramic Types: El Paso Polychrome, Chupadero Black-on-white
Ground Stone: present
Chipped Stone: present
Site Location within Survey Area: southwestern section
Mitigation Activities: none
Dates: none

Site No.: FB5048

Cultural Period/Phase: unknown
Site Area: .01 ha
Hearths: 0
Maximum Ceramic Density: no ceramics present
Major Ceramic Types: none
Ground Stone: none
Chipped Stone: present

Site No.: FB5048, continued

Site Location within Survey Area: southeastern section
Mitigation Activities: none
Dates: none

Site No.: FB5049

Cultural Period/Phase: unknown
Site Area: .08 ha
Hearths: 0
Maximum Ceramic Density: no ceramics present
Major Ceramic Types: none
Ground Stone: none
Chipped Stone: present
Site Location within Survey Area: northwestern section
Mitigation Activities: none
Dates: none

Site No.: FB5050

Cultural Period/Phase: unknown
Site Area: .14 ha
Hearths: 1
Maximum Ceramic Density: no ceramics present
Major Ceramic Types: none
Ground Stone: present
Chipped Stone: present
Site Location within Survey Area: northwestern section
Mitigation Activities: none
Dates: none

Site No.: FB5051

Cultural Period/Phase: Jornada Mogollon, Formative period, A.D. 250-1400
Site Area: .19 ha
Hearths: 2
Maximum Ceramic Density: less than 6 per m^2
Major Ceramic Types: Undifferentiated brownware
Ground Stone: present
Chipped Stone: present
Site Location within Survey Area: northwestern section
Mitigation Activities: none
Dates: none

Site No.: FB5052

Cultural Period/Phase: Jornada Mogollon, inseparable Mesilla phase and El Paso phase components present, A.D. 250-1400.

Site No.: FB5052, continued

Site Area: .08 ha
Hearths: 0
Maximum Ceramic Density: 21-50 per m^2
Major Ceramic Types: El Paso Brown, Chupadero Black-on-white, Mimbres Black-on-white, El Paso Polychrome
Ground Stone: present
Chipped Stone: present
Site Location within Survey Area: northeastern section
Mitigation Activities: none
Dates: none

Site No.: FB5053

Cultural Period/Phase: Jornada Mogollon, Mesilla phase, A.D. 250-1100, El Paso phase, A.D. 1200-1400
Site Area: 1.3 ha
Hearths: 3-5
Maximum Ceramic Density: 21-50 per m^2
Major Ceramic Types: El Paso Brown, El Paso Polychrome, Mimbres Black-on-white, Chupadero Black-on-white, Three Rivers Red-on-terra cotta
Ground Stone: present
Chipped Stone: present
Site Location within Survey Area: southwestern section
Mitigation Activities: none
Dates: none

Site No.: FB5054

Cultural Period/Phase: Jornada Mogollon, El Paso phase, A.D. 1200-1400
Site Area: .07 ha
Hearths: 1-5
Maximum Ceramic Density: 6-20 per m^2
Major Ceramic Types: El Paso Polychrome, El Paso Bichrome
Ground Stone: present
Chipped Stone: present
Site Location within Survey Area: southwestern section
Mitigation Activities: none
Dates: none

Site No.: FB5055

Cultural Period/Phase: Jornada Mogollon, El Paso phase, A.D. 1200-1400
Site Area: .05 ha
Hearths: 1
Maximum Ceramic Density: 6-20 per m^2
Major Ceramic Types: El Paso Polychrome, El Paso Bichrome, Chupadero Black-on-white, El Paso Brown
Ground Stone: none
Chipped Stone: present
Site Location within Survey Area: southwestern section

Site No.: FB5055, continued

Mitigation Activities: none
Dates: none

Site No.: FB5056

Cultural Period/Phase: Jornada Mogollon, El Paso phase, A.D. 1200-1400
Site Area: .01 ha
Hearths: 0
Maximum Ceramic Density: 21-50 per m^2
Major Ceramic Types: El Paso Polychrome
Ground Stone: none
Chipped Stone: none
Site Location within Survey Area: northwestern section
Mitigation Activities: none
Dates: none

Site No.: FB5057

Cultural Period/Phase: Jornada Mogollon, Formative period, A.D. 250-1100
Site Area: .01 ha
Hearths: 0
Maximum Ceramic Density: less than 6 per m^2
Major Ceramic Types: Undifferentiated brownware
Ground Stone: present
Chipped Stone: present
Site Location within Survey Area: northeastern section
Mitigation Activities: surface collection
Dates: none

Site No.: FB5058

Cultural Period/Phase: unknown
Site Area: .01 ha
Hearths: 2
Maximum Ceramic Density: no ceramics present
Major Ceramic Types: none
Ground Stone: present
Chipped Stone: present
Site Location within Survey Area: northeastern section
Mitigation Activities: test excavation and surface collection
Dates: none

Site No.: FB5059

Cultural Period/Phase: unknown
Site Area: .48 ha
Hearths: 4
Maximum Ceramic Density: no ceramics present

Site No.: FB5059, continued

Major Ceramic Types: none
Ground Stone: present
Chipped Stone: present
Site Location within Survey Area: southwestern section
Mitigation Activities: none
Dates: none

Site No.: FB5060

Cultural Period/Phase: Jornada Mogollon, El Paso phase, A.D. 1200-1400
Site Area: .01 ha
Hearths: 0
Maximum Ceramic Density: less than 6 per m^2
Major Ceramic Types: Chupadero Black-on-white, Undifferentiated brownware
Ground Stone: none
Chipped Stone: present
Site Location within Survey Area: northeastern section
Mitigation Activities: test excavation and surface collection
Dates: none

Site No.: FB5061

Cultural Period/Phase: Jornada Mogollon, El Paso phase, A.D. 1200-1400
Site Area: .44 ha
Hearths: 1
Maximum Ceramic Density: less than 6 per m^2
Major Ceramic Types: El Paso Polychrome
Ground Stone: present
Chipped Stone: present
Site Location within Survey Area: southeastern section
Mitigation Activities: none
Dates: none

Site No.: FB5062

Cultural Period/Phase: Jornada Mogollon, El Paso phase, A.D. 1200-1400
Site Area: .18 ha
Hearths: 1
Maximum Ceramic Density: less than 6 per m^2
Major Ceramic Types: El Paso Polychrome
Ground Stone: present
Chipped Stone: present
Site Location within Survey Area: southeastern section
Mitigation Activities: none
Dates: none

Site No.: FB5088

Cultural Period/Phase: unknown
Site Area: .01 ha
Hearths: 0
Maximum Ceramic Density: no ceramics present
Major Ceramic Types: none
Ground Stone: present
Chipped Stone: present
Site Location within Survey Area: northwestern section
Mitigation Activities: none
Dates: none

Site No.: FB5089

Cultural Period/Phase: unknown
Site Area: .08 ha
Hearths: 2
Maximum Ceramic Density: no ceramics present
Major Ceramic Types: none
Ground Stone: none
Chipped Stone: present
Site Location within Survey Area: northeastern section
Mitigation Activities: none
Dates: none

Site No.: FB5090

Cultural Period/Phase: Jornada Mogollon, Mesilla phase, A.D. 250-1100
Site Area: .06 ha
Hearths: 1
Maximum Ceramic Density: less than 6 per m^2
Major Ceramic Types: El Paso Brown
Ground Stone: none
Chipped Stone: present
Site Location within Survey Area: northeastern section
Mitigation Activities: none
Dates: none

Site No.: FB5091

Cultural Period/Phase: unknown
Site Area: .01 ha
Hearths: 1
Maximum Ceramic Density: no ceramics present
Major Ceramic Types: none
Ground Stone: none
Chipped Stone: present
Site Location within Survey Area: northeastern section
Mitigation Activities: none
Dates: none

Site No.: FB5092

Cultural Period/Phase: unknown
Site Area: .32 ha
Hearths: 5-10
Maximum Ceramic Density: no ceramics present
Major Ceramic Types: none
Ground Stone: present
Chipped Stone: present
Site Location within Survey Area: northeastern section
Mitigation Activities: none
Dates: none

Site No.: FB5093

Cultural Period/Phase: unknown
Site Area: .04 ha
Hearths: 1
Maximum Ceramic Density: no ceramics present
Major Ceramic Types: none
Ground Stone: present
Chipped Stone: none
Site Location within Survey Area: northeastern section
Mitigation Activities: none
Dates: none

Site No.: FB5094

Cultural Period/Phase: Jornada Mogollon, El Paso phase, A.D. 1200-1400
Site Area: .04 ha
Hearths: 0
Maximum Ceramic Density: less than 6 per m^2
Major Ceramic Types: El Paso Polychrome
Ground Stone: present
Chipped Stone: present
Site Location within Survey Area: southwestern section
Mitigation Activities: none
Dates: none

Site No.: FB5095

Cultural Period/Phase: unknown
Site Area: .14 ha
Hearths: 1
Maximum Ceramic Density: no ceramics present
Major Ceramic Types: none
Ground Stone: none
Chipped Stone: present
Site Location within Survey Area: southwestern section
Mitigation Activities: none
Dates: none

Site No.: FB5096
Cultural Period/Phase: Jornada Mogollon, Formative period, A.D. 250-1100.
Site Area: .08 ha
Hearths: 1
Maximum Ceramic Density: less than 6 per m^2
Major Ceramic Types: Undifferentiated brownware
Ground Stone: present
Chipped Stone: none
Site Location within Survey Area: northwestern section
Mitigation Activities: none
Dates: none

Site No.: FB5097
Cultural Period/Phase: unknown
Site Area: .12 ha
Hearths: 2
Maximum Ceramic Density: no ceramics present
Major Ceramic Types: none
Ground Stone: none
Chipped Stone: present
Site Location within Survey Area: northeastern section
Mitigation Activities: none
Dates: none

Site No.: FB5109
Cultural Period/Phase: Jornada Mogollon, El Paso phase, A.D. 1200-1400
Site Area: .50 ha
Hearths: 0
Maximum Ceramic Density: less than 6 per m^2
Major Ceramic Types: El Paso Polychrome, Chupadero Black-on-white, Playas Red
Ground Stone: present
Chipped Stone: present
Site Location within Survey Area: northeastern section
Mitigation Activities: surface collection
Dates: none

Site No.: FB9635
Cultural Period/Phase: Jornada Mogollon, Formative period, A.D. 250-1400
Site Area: .25 ha
Hearths: 0
Maximum Ceramic Density: less than 6 per m^2
Major Ceramic Types: Undifferentiated brownware
Ground Stone: none
Chipped Stone: none
Site Location within Survey Area: northwestern section
Mitigation Activities: none
Dates: none

Site No.: FB9636

Cultural Period/Phase: Jornada Mogollon, Formative period, A.D. 250-1400.
Site Area: .23 ha
Hearths: 0
Maximum Ceramic Density: less than 6 per m^2
Major Ceramic Types: Undifferentiated brownware
Ground Stone: none
Chipped Stone: none
Site Location within Survey Area: northwestern section
Mitigation Activities: none
Dates: none

Appendix B

SURFACE COLLECTION DATA (FB5027)

Appendix B lists the archaeological material recovered from site FB5027. Please see Chapter V, "Methodology," for a description of the survey technique employed on the site.

KEY:

SQ# = Square number. Test units are listed by number in the left-hand column.
* = Artifacts not accounted for by the artifact categories employed were recorded. The artifacts in question are listed by square number on the last page of this appendix.
CO = Component. "M" indicates the test unit is located on the Mesilla phase component, "E" indicates the El Paso phase component.

Artifact categories are identified by the letters listed below. The quantity of artifacts belonging to each artifact category is listed for each test unit.

Ceramics

A = El Paso Polychrome
B = El Paso Brown
C = Unspecified Brownware
D = Chupadero Black-on-white
E = Mimbres Ware
F = Playas Red
G = Three Rivers
H = Unknown ceramics
I = Worked sherds

Fire-cracked Rock

J = Fire-cracked rock

Ground Stone

K = Mano fragments
L = Metate fragments
M = Undetermined ground stone

Chipped Stone

N = Primary flakes
O = Secondary flakes
P = Tertiary flakes
Q = Shatter with cortex
R = Shatter without cortex
S = Hammerstones
T = Cores
U = Facially retouched flakes
V = Marginally retouched flakes
W = Utilized flakes

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Test Unit Squares 1-36

Sq. #	CO	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W
1	M	3	3	41							3	1	1		1	2	4	4	4					
2	M			18								1		1		1	3	5	1					
3	M	4	2	124		5					15			1	1	19	41	14	2					
4	E	2		78	2	2					9		1		1	4	3	2						
5	M	1	3	39		2					7			1	1	1	5	2						
6	M	2		13		1					6					3	2		1					
7	E			1	1						4	1												
8	M			1							1							1						
9	M					1														1				
10	M	7	1	43									1		1	2	8	4	4					
11	M	13	3	62							7				1	8		3		1	1			1
12	M	5		17							3					2								
13	M	4	1	35		2				1	4				1		3							
14	M		1	28		3					24		1		1	2	2		1					
15	M			4							1							1						
16	M	1		14							1		1			1		1			1			
17	M			1		1											1							
18	M			1																				
19	M	3	3	56							6	2				7	17	3	3					
20*	M	6	3	60	2						3		1	1		8	15	5	2					
21	M	1	4	19							3				3	1	4		1					
22	E	16		40	6		11	1	1	1	3			1		7	4	6	1					
23	E	7		22	3						15	1		1	1		3	2						
24	E	16		141	5	1					20				3	7	8	3						
25	E	4		6							10		1				2							
26	E	7		28	2					1	1				1	1	3	1						
27	E	3		8	4												1							
28	E	39		98	4						8				1	1	4	4			1			
29	E	13	3	65	3				5		4					4	2							1
30	E	36		79	7			1			7	1			1	7	13	3	4					
31	E			1																				
32	E	1		7	2								1			4								
33	E	84		330	7	1			7		9				1	11	27	11	5					
34	E	25		43		2					7			1	2	7	7	3			3			
35	E			3							1					1		1						
36	E	15		58	1			1			3					1	8	3			1			

Test Units 37-72

Sq. #	CO	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W
37	E	3		9							4				1		1	1						
38	E	3		11							9										1			
39	E	1		11																				
40	E	4		9							3													
41*	E	2		2							1	1												
42	M			2																				
43	M	No Data (no artifacts recorded)																						
44	E	No Data (no artifacts recorded)																						
45	E			1													1							
46	M	No Data (no artifacts recorded)																						
47	E			4	1						2						1							
48	M	2		3											1									
49	M			13							1													
50	E			5												1	1	1						
51	E	1																1						
52	E			3																				
53	E	9	3	67	6	1					9						1	2	1	1				
54	M	7		30		2					13				1	1	3							
55	M			2																				
56	M	No Data (no artifacts recorded)																						
57	M			5																				
58	M			9															1		1			
59	M			1														1						
60	E	32		80	2						15		1			5	7	4						
61	E	No Data (no artifacts recorded)																						
62	E	44		10	1						2							6	1					
63	E															3								
64*	E	34		202	10	1					2	1			1	17	33	13	14					
65	E			3													1							
66	E		3	35	1											3	4	1	4		2			
67	E	3		33							1	1				1	1	2	1					
68	E			115																				
69	E			8							2							1	1		1			
70	E	5	1	36	5						1		1	1			3	1						1
71	E	No Data (no artifacts recorded)																						
72	E	1		16							6					2	1	1						

Test Unit Squares 73-108

Sq. #	CO	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W
73	E	1		10							2					3	2	2						
74	E			1				1			1													
75	E													1										
76	E	No Data (no artifacts recorded)																						
77	E	12		18												1		1						
78	M	No Data (no artifacts recorded)																						
79	M			1																				
80	M	3		11							4	1			1	2	1	1						
81	M	No Data (no artifacts recorded)																						
82	M	1		9							13					2		1	1					
83	M			7							2										1			
84	M	No Data (no artifacts recorded)																						
85	M			3													1							
86	M	No Data (no artifacts recorded)																						
87	M	1		3																				
88	M			1																				
89	M			20		3										1	2							
90	M			1																				
91	M	1	2	3											2	5	1	1	1					
92	M	2		39						3	3						1	2	1					
93	M	3		7																	1			
94	M	No Data (no artifacts recorded)																						
95	M	2		16		5									1	3	2	1						
96	M	4	4	53		2					8						4	1						
97	M	2		30		1					3				1	3	1							
98	M	No Data (no artifacts recorded)																						
99	M	No Data (no artifacts recorded)																						
100	M	5	1	38		1					20	1		1	3	4	9				2			1
101	M	1														1	2							
102	M			4												1		1						
103	M			2																				
104	M			1																				
105	M																							1
106	M	No Data (no artifacts recorded)																						
107	M	No Data (no artifacts recorded)																						
108	M	4		20							3				1	2		2	1	1	1			

Test Unit Squares 109-145

Sq. #	CO	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W
109	M	No Data (no artifacts recorded)																						
110	M			1																				
111	M	No Data (no artifacts recorded)																						
112	M			1														1						
113	M	2	2	195											3	24	28	5	4					
114	M			3																				
115	M	1		6											1			2						
116	M			2							1	2				1		3			1			
117	M			10														1						
118	M		1	12							3						1							
119	M										1													
120	M	2	2	26												5	17	4			1			
121	M	48	3	46	1	3					15		1			12	15	5			1			
122	M	11	3	169		2					22	2			5	61	109	29	11		3	1		
123	M	5	6	82		4					3					9	7	1	6					
124	M			2																				
125	M			2																				1
126	M			3											3			1						
127	M	2		39		1					5					1	1							
128	M			46		3										1	1	2						
129	M		1	27		1									2	1	2				1			
130	M	3	1	51							1					4		1						
131	M	1		29												1		2						
132	M		3	94		2					6				1	7	11	1		1				
133	M			92												1	2							1
134	M			5																				
135	M	2		18												5	2						1	
136	M	1	2	113		3									2	8	17	8	2					
137	M	1	2	45																				
138	M												2		1	1	4	1						
139	M	No Data (no artifacts recorded)																						
140	M			11																				
141	M			1																				
142	M			15							2					3		1	1					
143	M		1	1																				
144	M	1		8							2					1	3	3						
145	M	No Data (no artifacts recorded)																						

Test Unit Squares 146-181

Sq. #	CO	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W
146	M		1	1																				
147	M																	1						
148	M		2	13													3		1					
149	M			1																				
150	M	3		72		1					20					5	2							
151	M	2		20												4	8	5	1					
152	M	2	2	26							2				1		1	3	3					
153	M			4		1																		
154	M	2	3	64		2					25					3	3	1						
155	M			1												1								
156	M	2	3	111		2										4	12	3	4		1			
157	M	No Data (no artifacts recorded)																						
158	M			1											1		1							
159	M	9		304		1									1	43	48	19	5		1			
160	M	18	22	622		11						4	2	2	6	90	182	57	24		4	1	3	
161	M	4	5	73												5	14	3	4					
162	M	No Data (no artifacts recorded)																						
163	M			39												2	2							
164	M	No Data (no artifacts recorded)																						
165	M	6	1	73											1	13	28	10	11		2			
166	M	1	2	32		1										2	5	4	2		1		1	
167	M			54												6	2	3			1			
168	M			1																				
169	M	2	3	106		4				1			1			5	5	3	1					
170	M		2	29		2										2	1				1			
171	M			80							2					1	2	6						
172	M	2	1	75		1									1	1	4	3	2	1				
173	M			2										1										
174	M	15	3	199		4									6	74	125	21	10	2	3		1	1
175	M			4								1					1							
176	M			1									1					1						
177	M			11													1							
178	M	5	5	169		1						1			1	2	2	2	1					
179	M	1	1	36		1				1	5					2	2						1	
180	M	No Data (no artifacts recorded)																						
181	M	No Data (no artifacts recorded)																						

Test Unit Squares 182-218

Sq. #	CO	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W
182	M			14		1												1			1			
183	M	No Data (no artifacts recorded)																						
184	M	No Data (no artifacts recorded)																						
185	M	1	1	12																			1	
186	M			4													1							
187	M			18									1			2	1							
188	M	No Data (no artifacts recorded)																						
189	M	No Data (no artifacts recorded)																						
190	M	No Data (no artifacts recorded)																						
191	M	No Data (no artifacts recorded)																						
192	M	No Data (no artifacts recorded)																						
193	M	No Data (no artifacts recorded)																						
194	M	No Data (no artifacts recorded)																						
195	M	No Data (no artifacts recorded)																						
196	M	No Data (no artifacts recorded)																						
197	M			16		4										1								
198	M			9		12															1			
199	M			23									1					1						
200	M			19		2									1	1	1	2						1
201	M																1	1						1
202	M	1		7									1				1							
203	E	9		32	4		2									2	1		2		1		1	
204	M	2	4	190		2				1					1	3	10	1			1			
205	M	No Data (no artifacts recorded)																						
206	M			1																				
207	M			1																				
208	M		1	2																				
209	M			5																				
210	M			1																				
211	M	No Data (no artifacts recorded)																						
212	M	No Data (no artifacts recorded)																						
213	M			2												1								
214	M	No Data (no artifacts recorded)																						
215	M			2													1							
216	M			2																				
217	M	No Data (no artifacts recorded)																						
218	M			1																				

Test Unit Squares 219-255

Sq. #	CO	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W
219	M	No Data (no artifacts recorded)																						
220	M			2																				
221	M		1																					
222	M	9	12	443		3				1					4	84	109	42	19	1	1			3
223	M			2												1	1							
224	M	7	4	169		4									1	19	51	14	14	2		1	1	
225	M			15												7	4	2	1					
226	M			7													2	1						
227	M			5		1										3	1	1					1	
228	M			1														2						
229	M	No Data (no artifacts recorded)																						
230	M	No Data (no artifacts recorded)																						
231	M		1	1																				
232	M	No Data (no artifacts recorded)																						
233	M	1		16												1	1	2						
234	M	No Data (no artifacts recorded)																						
235	M																1				1			
236	M	No Data (no artifacts recorded)																						
237	M			3														2						
238	M	1		5																				
239	M	No Data (square plotted but lies outside site's boundaries)																						
240	M			2																				
241	M	No Data (no artifacts recorded)																						
242	M			2																				
243	M			3												1		1						
244*	M	4	15	295		1				2				1	4	46	63	16	5		1			
245	M			45												8	19	3						
246	M		5	103		1						1				1	3	3	3					
247	M	No Data (no artifacts recorded)																						
248	M		1	13		1											2							
249	M			13												2	7	1						
250	M			1																				
251	M	14	15	641		12									7	86	130	37	29		3			1
252	M	No Data (no artifacts recorded)																						
253	M			24												1	2	1						
254	M	No Data (no artifacts recorded)																						
255	M			1																				

Other Artifacts Recorded on Site FB5027

Test Unit	*Artifact(s)*
20	1 bead
41	1 mano/metate fragment
64	4 worked turquoise fragments
244	1 worked turquoise fragment

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REFERENCES

Amick, D., R. Mauldin, and S. Tomka
1986 *An Evaluation of Debitage Produced by Experimental Bifacial Core Reduction of a Georgetown Chert Nodule*. Paper presented at the 44th Plains Conference, Denver, Colorado.

Bartlett, K.
1933 Pueblo Milling Stones of the Flagstaff Region and Their Relation to Others in the Southwest. *Museum of Northern Arizona Bulletin* 3. Northern Arizona Society of Science and Art, Flagstaff.

Beckes, M.
1977 *Prehistoric Cultural Stability and Change in the Southern Tularosa Basin*. Unpublished Ph.D. dissertation, Department of Anthropology, University of Pittsburgh, Pittsburgh, Pennsylvania.

Beckes, M., D.S. Dibble, and M.D. Freeman
1977 A Cultural Resource Inventory and Assessment of McGregor Guided Missile Range: Otero County, New Mexico. Part 1. *Texas Archaeological Survey Research Report* No. 6511. The University of Texas at Austin.

Berry, M.
1982 *Time, Space, and Transition in Anasazi Prehistory*. University of Utah Press, Salt Lake City.

Binford, Lewis R.
1978 *Nunamiut Ethnoarchaeology*. Academic Press, New York.

1980 Willow Smoke and Dogs' Tails: Hunter-Gatherer Settlement Systems and Archaeological Site Formation. *American Antiquity* 45:4-20.

1982 The Archaeology of Place. *Journal of Anthropological Archaeology* 1(1):5-31.

1983a *In Pursuit of the Past*. Thames and Hudson, New York.

1983b Long Term Land Use Patterns: Some Implications for Archaeology. In LuLu Linear Punctuated: Essays in Honor of George Irving Quimby, edited by R.C. Dunnell and D.K. Grayson. *Anthropological Papers of the Museum of Anthropology* No. 72, Ann Arbor, Michigan.

Bradley, R. Jane E.
1983 *La Cabrana: A Study of Fourteenth Century Resource Utilization in Southern New Mexico*. Unpublished M.A. thesis, The University of Texas at El Paso.

Braun, D.P.
1983 Pots as Tools. In *Archaeological Hammers as Theories*, edited by A. Keene. Academic Press, New York.

Brook, V.R.
1970 Four Archaeomagnetic Dates from the Hot Wells Site (EPAS-3). *The Artifact* 8(1).

Carmichael, David
1981 Non-Residential Occupation of the Prehistoric Southern Tularosa Basin, New Mexico. *The Artifact* 19(3&4):51-68.

1983 Archaeological Survey in the Southern Tularosa Basin, New Mexico. Ms. on file, Directorate of Environment, Fort Bliss, Texas

1985 Archaeological Excavations at Two Prehistoric Campsites Near Keystone Dam, El Paso, Texas. *University Museum Occasional Papers* No. 14. New Mexico State University, Las Cruces.

Carniero, R.
1970 A Theory of the Origin of the State. *Science* 169:733-38.

Cosgrove, C.B.
1947 Caves of the Upper Gila and Hueco Areas in New Mexico and Texas. *Papers of the Peabody Museum* 24(2). Harvard University, Cambridge, Massachusetts.

Cully, Anne C. and Karen H. Clary
1980 Pollen Analysis at Keystone Dam. In The Keystone Dam Site, edited by T. O'Laughlin. *El Paso Centennial Museum Publications in Anthropology* No. 8, The University of Texas at El Paso.

DeGarmo, Glen
1983 The Archaeological Program at Fort Bliss, Texas. *Proceedings of the American Society for Conservation Archaeology* 1983:32-40.

Driver, H.E. and W.C. Massey
1957 Comparative Studies of North American Indians. *Transactions of the American Philosophical Society* n.s. 47(2).

Fields, Ross C. and Jeff S. Girard
1983 Investigations at Site 32 (41 EP 325), Keystone Dam Projects. *Reports of Investigations,* Number 21. Prewitt and Associates, Inc., Austin, Texas.

Foley, R.
1981 A Model of Regional Archaeological Structure. *Proceedings of the Prehistoric Society* 47:1-17.

Ford, R.I.
1985 Patterns of Prehistoric Food Production in North America. In Prehistoric Food Production in North America, edited by R.I. Ford. *Anthropological Papers of the Museum of Anthropology* No. 75, University of Michigan, Ann Arbor.

Fort Bliss Historical Preservation Plan
1982 Fort Bliss Historical Preservation Plan. Ms. on file, Directorate of Environment, Fort Bliss, Texas.

Foster, M., R.J. Bradley, and C. Williams

1981 Prehistoric Diet and Subsistence Patterns of La Cabrana Pueblo. *The Artifact* 19(3&4):151-168.

Freeman, C.E.

1972 Pollen Study of Some Holocene Alluvial Deposits in Doña Ana County, Southern New Mexico. *The Texas Journal of Science* 24(2):203-220.

Goldborer, S.E.

1985 *The Relationship of Reliance on, and Intensity of Agriculture to the Presence of Pottery.* Paper presented at the 50th annual meeting of the Society for American Archaeology, Denver, Colorado.

Gould, Richard A.

1968 Living Archeology: The Nagatajara of Western Australia. *Southwestern Journal of Anthropology* 24(2):101-122.

1980 *Living Archaeology.* Cambridge University, Cambridge, England.

Hard, Robert J.

1980 Model of Adaptation from 6,000 B.C. to A.D. 1150 in West Texas and Southern New Mexico. Ms. on file, Directorate of Environment, Fort Bliss, Texas.

1983a Excavations in the Castner Range Archaeological District of El Paso, Texas. *El Paso Centennial Museum Publications in Anthropology* No. 11. The University of Texas at El Paso.

1983b Settlement and Subsistence in the Chihuahuan Desert: Cultural-Ecological Models for Fort Bliss, Texas. *Proceedings of the American Society for Conservation Archaeology* 1983:41-51.

1986 *Ecological Relationships Affecting the Rise of Farming Economies: A Test from the American Southwest.* Unpublished Ph.D. dissertation, Department of Anthropology, University of New Mexico, Albuquerque.

Hard, Robert J. and Raymond P. Mauldin

1986 Settlement and Subsistence Modeling: An Example From West Texas. Ms. on file, Directorate of Environment, Fort Bliss, Texas.

Hayes, Alden C., Jon Nathan Young and A.H. Warren

1981 Excavation of Mound 7, Gran Quivira National Monument, New Mexico. *Publications in Archeology* 17. National Park Service, Washington, D.C.

Hitchcock, Robert Karl

1982 *The Ethnoarchaeology of Sedentism: Mobility Strategies and Site Structure Among Foraging and Food Producing Populations in the Eastern Kalahari Desert.* Ph.D. dissertation, University of New Mexico. University Microfilms, Ann Arbor, Michigan.

Horowitz, A., R.E. Gerald, and M.S. Chaiffetz
1981 Preliminary Paleoenvironmental Implications of Pollen Analyzed from Archaic, Formative, and Historic Sites Near El Paso, Texas. *Texas Journal of Science* 23:61-72.

Judge, W.J.
1973 *Paleo Indian Occupation of the Central Rio Grande Valley in New Mexico.* University of New Mexico Press, Albuquerque.

Kauffman, B.
1984 The Vista Hills Site: Eight Thousand Years at the Edge of the Hueco Bolson. *Cultural Resources Management Division Report* 563. New Mexico State University, Las Cruces.

Kauffman, B. and D. Batcho
1983 *Ephemeral Sites and Resilient Folks: A Discussion and Analysis of Seven Archaeological Sites near Las Cruces, New Mexico, Tested as Part of the Eleno Gallegas Land Exchange.* Cultural Resources Management Division, Las Cruces, New Mexico.

Kegley, G.
1982 *Archaeological Investigations at Hueco Tanks State Historical Park, El Paso County, Texas.* Texas Parks and Wildlife Department, Austin.

Kelly, Isabel
1964 Southern Paiute Ethnography. *University of Utah Anthropological Papers* 69. Salt Lake City.

Kelly, Robert L.
1983 Hunter-Gatherer Mobility Strategies. *Journal of Anthropological Research* 39(3):277-306.

Krone, M.F.
1975 A Report on Folsom Points Found in the El Paso Area. *The Artifact* 13(4):1-19.

Lancaster, J.
1983 *An Analysis of Manos and Metates from the Mimbres Valley, New Mexico.* Unpublished M.A. thesis, University of New Mexico, Albuquerque.

LeBlanc, Steven A. and Michael E. Whalen
1980 *An Archaeological Synthesis of South-Central and Southwestern New Mexico.* Office of Contract Archaeology, University of New Mexico, Albuquerque.

Lee, R.
1979 *The !Kung San: Men, Women, and Work in a Foraging Society.* Cambridge University Press, Cambridge, England.

Lehmer, D.J.
1948 The Jornada Branch of the Mogollon. *University of Arizona Social Science Bulletin* 17, Tucson.

Lukowski, P.D. and R.P. Mauldin
1986 A Progress Report on the Boulder Canyon Archaeological Project. Ms. On file, Directorate of Environment, Fort Bliss, Texas.

Martin, P.S. and F. Plog
1974 *The Archaeology of Arizona.* Doubleday-Natural History Press, New York.

Martin, P.S. and J.B. Rinaldo
1947 The SU Site, Excavations at a Mogollon Village, Western New Mexico: 3rd Season, 1946. *Fieldiana: Anthropology* 32(3).

Mauldin, R.P.
1984 *Settlement and Subsistence Patterns during the Pueblo Period on Fort Bliss, Texas: A Model.* Paper presented at the Third Mogollon Conference, Las Cruces, New Mexico.

1985 An Initial Report on the DIVAD Archaeological Project. *The Artifact* 23.

Murdock, G.P. and S.F. Wilson
1980 Community Organization: Cross-Cultural Codes 3. In *Cross-Cultural Samples and Codes,* edited by H. Barry III and A. Schlegel, pp. 45-73. University of Pittsburgh, Pittsburgh, Pennsylvania.

Nelson, B.
1985 *Decoding Prehistoric Ceramics.* Southern Illinois University Press, Carbondale.

Noy-Meir, I.
1973 Desert Ecosystems: Environment and Procedures. *Annual Review of Ecology and Systematics* 4. Palo Alto, California.

1974 Desert Ecosystems: Higher Trophic Levels. *Annual Review of Ecology and Systematics* 5. Palo Alto, California.

O'Laughlin, T.C.
1980 The Keystone Dam Site and Other Archaic and Formative Sites in Northwest El Paso, Texas. *El Paso Centennial Museum Publications in Anthropology* No. 8, The University of Texas at El Paso.

Orton, Robert
1978 The Climate of Texas. In *Climates of the States,* vol. 2. Gale Research Co. Book Tower, Detroit, Michigan.

Photographic Interpretation Corporation, Hanover, New Hampshire
1979 Fort Bliss Environmental Analysis and Impact Assessment. Ms. on file at the Directorate of Environment, Fort Bliss, Texas.

Pierce, C.
1984 *Analysis of Cooking Stones from a Late Period Chumash Village.* Paper presented at the 49th annual meeting of the Society for American Archaeology, Portland, Oregon.

Reynolds, S.E.
1956 Climatological Summary, New Mexico-Precipitation 1849-1954. *U.S. Department of Commerce Technical Report* No. 6., Washington, D.C.

Satterwhite, M.B. and J. Ehlen
1980 *Vegetation and Terrain relationships in South-Central New Mexico and Western Texas.* U.S. Army Engineer Topographic Laboratories, Fort Belvoir, Virginia.

1982 Landform-Vegetation Relationships in the Northern Chihuahuan Desert. In Aridic Soils and Geomorphic Processes, edited by D.H. Yaalon. *CATENA Supplement* 1, West Germany.

Scarborough, V.L.
1984 *Meyer Pithouse Village: A Preliminary Assessment.* Paper presented at the Third Mogollon Conference, Las Cruces, New Mexico.

1986 Meyer Pithouse Village. Ms. on file, Environmental Management Office, Fort Bliss, Texas.

Simms, S.R.
1983 The Effects of Grinding Stone Reuse on the Archaeological Record in the Eastern Great Basin. *Journal of California and Great Basin Anthropology* 5:98-102.

Skelton, D.W. et al.
1981 A Cultural Resource Inventory and Assessment of Doña Ana Range, New Mexico. *Texas Archaeological Survey Research Report* No. 69. The University of Texas at Austin.

Stahle, D.W. and J.E. Dunn
1982 An Analysis and Application of the Size Distribution of Waste Flakes from the Manufacture of Bifacial Stone Tools. *World Archaeology.* 14(1):84-97.

Stiger, M.A.
1980 Ceramics, Grass, and Demography Among Hunter-Gatherers. Ms. on file, Clark Field Archives, Department of Anthropology, University of New Mexico, Albuquerque.

Stuiver, M. and Becker, B.
1986 High-precision Calibration of the Radiocarbon Time Scale, A.D. 1950-2500 B.C. *Radiocarbon* 28:863-910.

Thomas, D.H.
1983 The Archaeology of Monitor Valley 1: Epistemology. *Anthropological Papers of the American Museum of Natural History* 58(1).

1984 *Diversity in Hunter-Gatherer Cultural Geography.* Paper presented at the 49th annual meeting of the Society for American Archaeology, Portland, Oregon.

Thompson, M.
1979 A Study of Prehistoric Campsites in Northeast El Paso. *Cultural Resources Management Division Report* 310. New Mexico State University, Las Cruces.

Tomka, S.A. and R.P. Mauldin
1984 *Experimental Lithic Reduction as a Guide to Behavioral Inference.* Paper presented at the 49th annual meeting of the Society for American Archaeology, Portland, Oregon.

United States Department of Agriculture, Weather Bureau
n.d. Climatological Records for El Paso, Texas, 1878-1950. Mss. on file, Directorate of Environment, Fort Bliss, Texas.

Upham, S.
1984 Adaptive Diversity and Southwestern Abandonments. *Journal of Anthropological Research* 40(2).

Van Devender, T.R. and W.G. Spaulding
1979 Development of Vegetation and Climate in the Southwestern United States. *Science* 204:701-710.

Van Devender, T.R. and L.J. Toolin
1982 The Holocene Development of Vegetation in the Western Hueco Mountains, Fort Bliss Army Base, El Paso County, Texas. Ms. on file, Directorate of Environment, Fort Bliss, Texas.

Vierra, Bradley J.
1985 *Hunter-Gatherer Settlement Systems: To Reoccupy or Not to Reoccupy, That Is the Question.* Unpublished M.A. thesis, University of New Mexico, Albuquerque.

Way, K.L.
1979 Early Pueblo Occupation in the Southern Tularosa Basin, New Mexico. In *Jornada Mogollon Archaeology: Proceedings of the First Jornada Conference,* edited by P.H. Beckett and R.N. Wiseman, pp. 41-52. New Mexico State University, Las Cruces.

West, K.L.
1982 *A Study of El Paso Brown Rim Form.* Unpublished M.A. thesis, The University of Texas at El Paso.

Whalen, M.E.
1977 Settlement Patterns of the Eastern Hueco Bolson. *El Paso Centennial Museum Publications in Anthropology* No. 4. The University of Texas at El Paso.

1978 Settlement Patterns of the Western Hueco Bolson. *El Paso Centennial Museum Publications in Anthropology* No. 6. The University of Texas at El Paso.

1980 Special Studies in the Archaeology of the Hueco Bolson. *El Paso Centennial Museum Publications in Anthropology* No. 9. The University of Texas at El Paso.

Yellen, R.
1977 *Archaeological Approaches to the Present.* Academic Press, New York.